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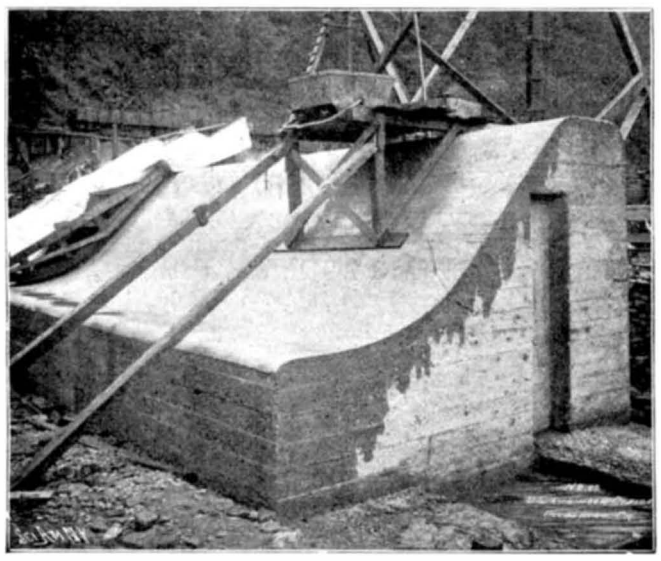
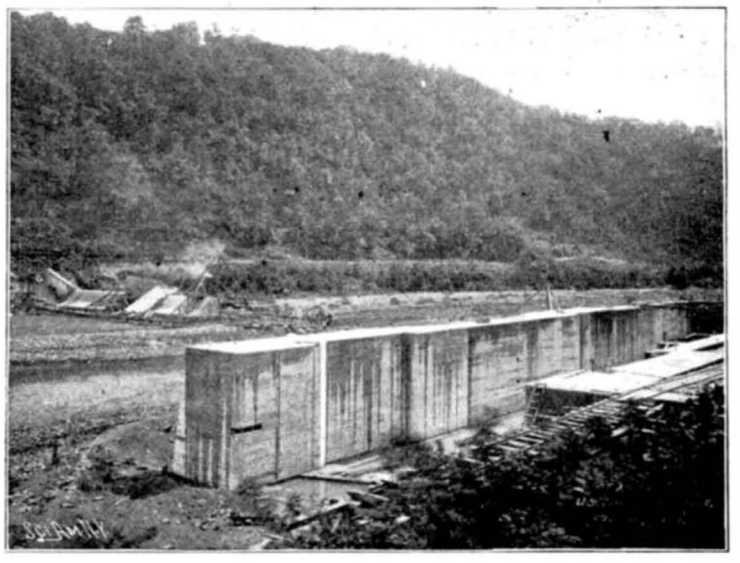
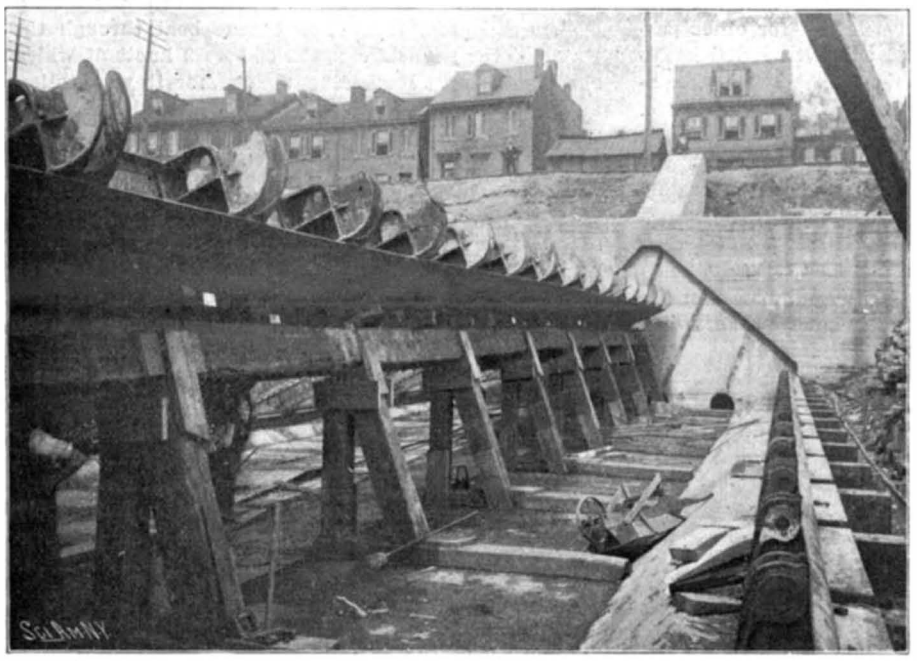


Dam 12, Monongahela River, Showing Method of Bonding Monoliths with Each Other and with Foundation.

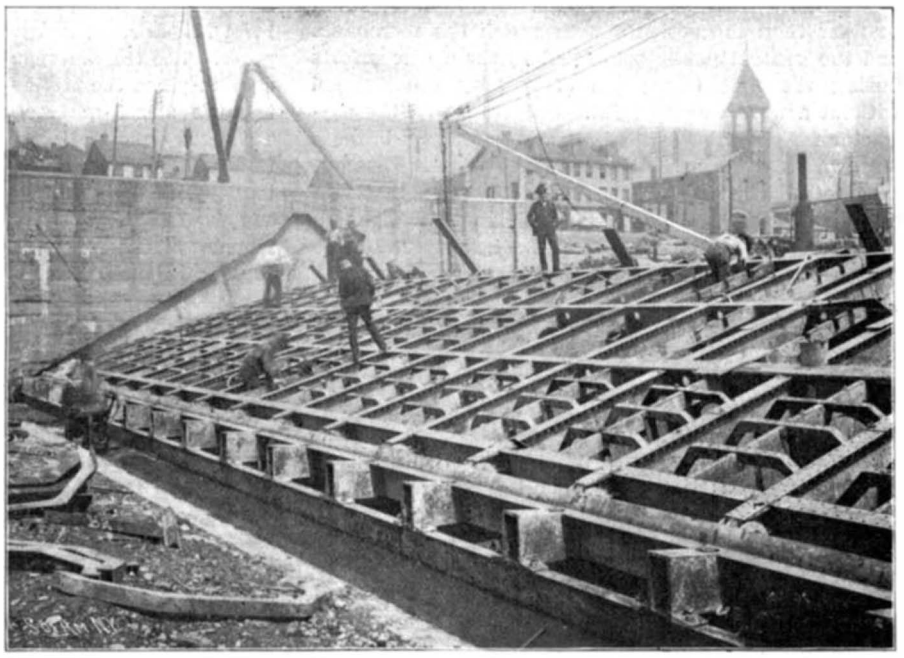
Navigable Pass Down Movable Dams, Ohio and Allegheny Rivers.



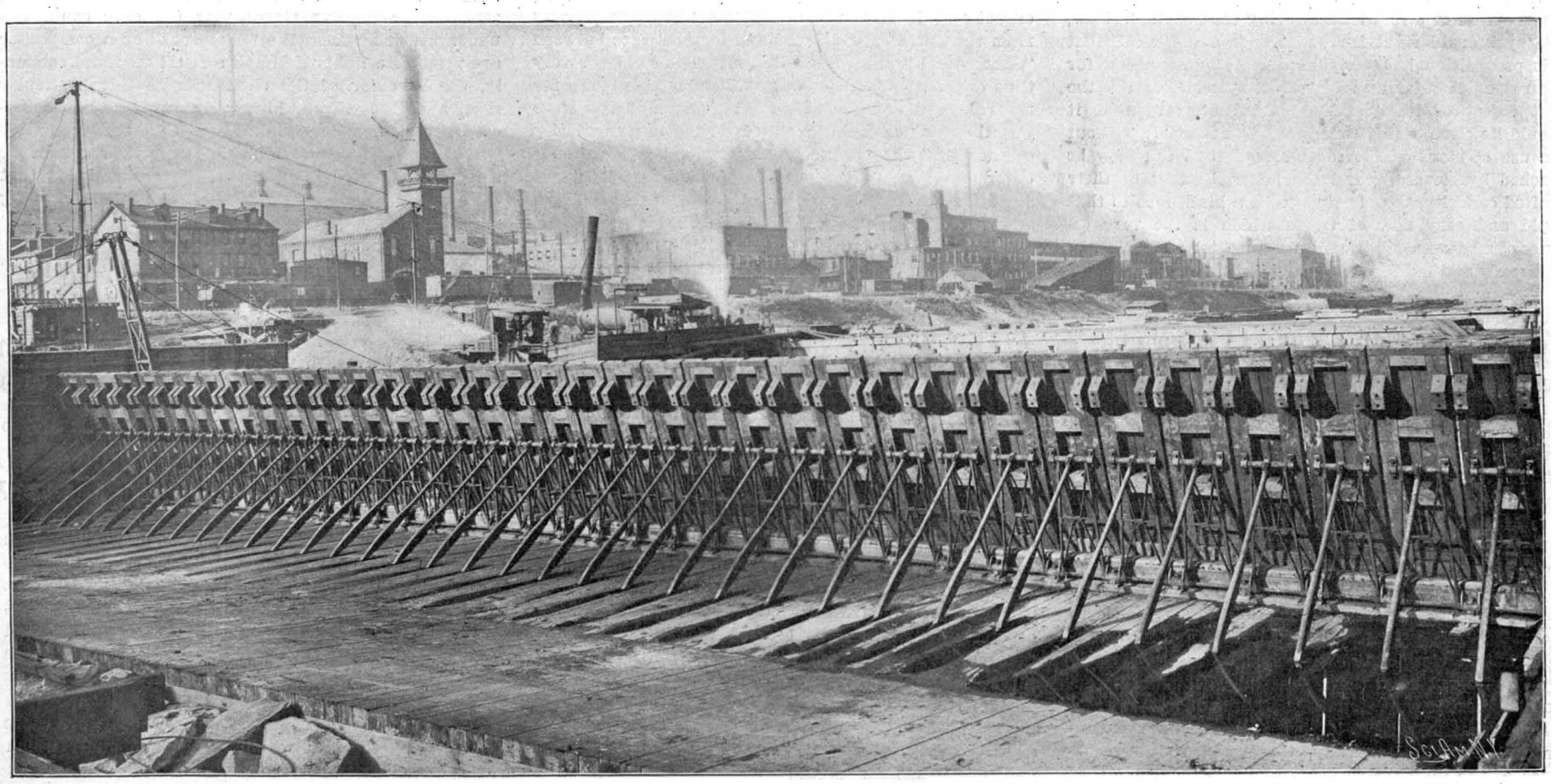
Lock and Dam No. 12, Monongahela River, Built in Monoliths 20 to 30 Feet Long.



Bear Trap Dam, Allegheny River, Looking Down Stream.



Movable Dam (Bear Trap Type) Allegheny River.



Navigable Pass up Movable Dams, Ohio and Allegheny Rivers.

WATERWAY IMPROVEMENT ON THE OHIO RIVER.—[See page 117.]

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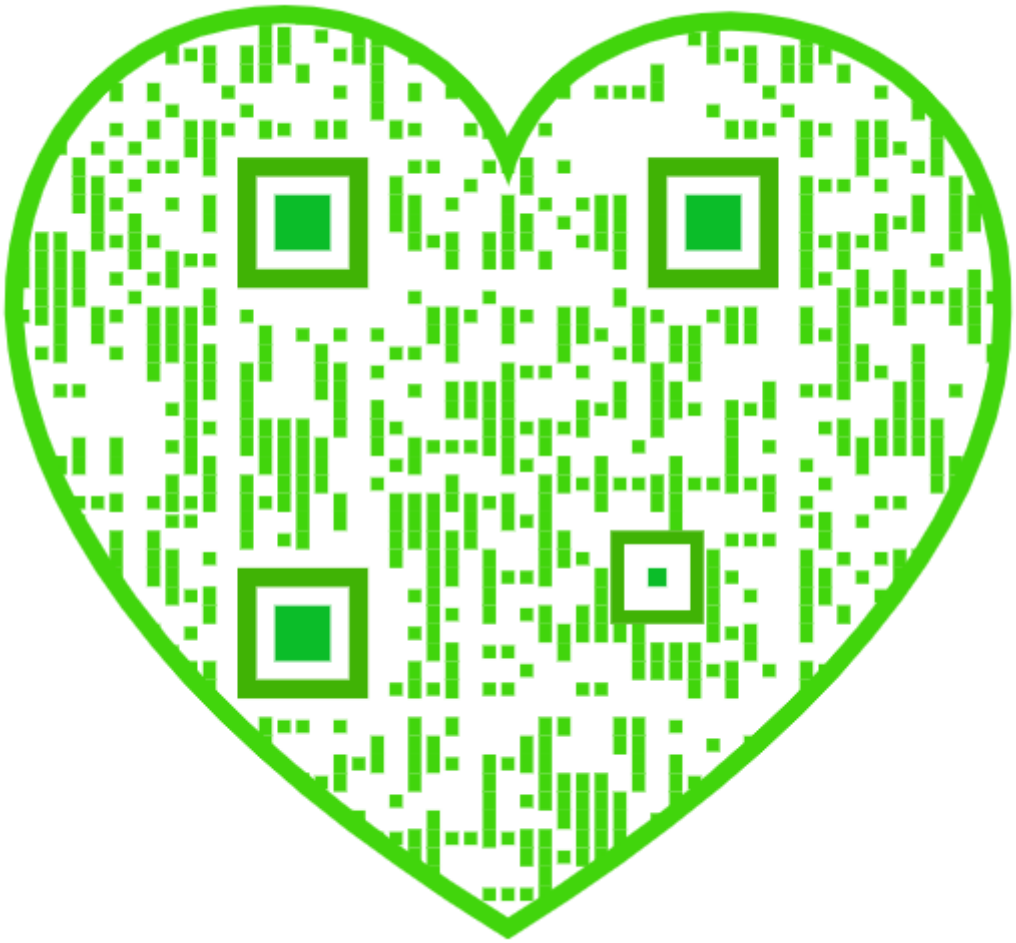

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NEW YORK, SATURDAY, AUGUST 15, 1903.

The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

BROADWAY TUNNEL CONTROVERSY.

The contractor for the Rapid Transit subway has himself to thank for the bitter opposition which is developing against the construction of a subway below Broadway. This opposition comes from the property holders, and it is prompted by the bitter experience of those merchants whose property has lain along the route of the subway which is now under construction. It is undeniable that the opening up of the streets and obstruction of the sidewalks incident to this work has wrought irreparable injury to the business interests affected. Now it was realized at the outset that a certain measure of inconvenience lasting for a considerable time was inevitable, and nothing could be finer than the patience with which the merchants and the general public submitted to these discomforts during the first two years of subway construction without a word of complaint. Unfortunately, the contractor for the subway has been so persistently blind to his own interests as to trade upon this complaisance, and instead of fulfilling the moral obligation that was upon him to close up the work as it was completed, and clear the streets at the earliest opportunity, he has permitted the work of cleaning up to drag along for months, and in some cases for years, longer than was necessary, and has shown a most callous indifference to the interests that were so vitally affected.

The vigorous protest which is being made against the construction of a tunnel beneath Broadway is perfectly natural; and it is a thousand pities that the contractor who started out by winning golden opinions because of the speed with which the work was commenced, should have aroused such opposition. Several of the daily papers have now combined in a campaign of opposition to a Broadway route, and one of them has come out boldly with the suggestion that the tunnel shall not be built near the surface by the "cut-and-cover" method, but that following the example of London it shall be built 60 to 80 feet below street level, with a view to avoiding interruption of street traffic during construction. Now, it may be said right here, and once and for all, that this proposition is utterly impossible of execution for the reason that for a rapid transit system to fulfill the first object of its existence, it is necessary that it should lie close to the surface and be accessible without the use of elevators. A deep-tunnel road can only be reached by elevators, and the latter, because of their limited capacity, would prove to be a hindrance to that rapid and easy flow of traffic which is the very essence of modern rapid transit. As a matter of fact, there is already a congestion at the elevators in the London service, and it has been proved that the capacity of these deep-level roads is limited by the capacity of the elevators that serve them. The rapid transit system in New York must be accessible with as little delay at stations as possible, and short of a street surface system, there is none so easily accessible as a subway that lies immediately beneath the street grade. The deep-tunnel system, therefore, may be eliminated from the problem at once and forever. They are a necessity in London; they would be a nuisance in New York.

It is a principle well recognized in our municipal improvements that the convenience of the few must ever be sacrificed to the great need of the many. The temporary derangement of traffic and loss of trade to the merchants during subway construction is deplorable; but in view of the enormous benefits ultimately to be conferred upon the city at large, it must be endured as best it may. Furthermore, the public may rest assured that if a high-level subway should be constructed beneath Broadway, there will be no recurrence of the inexcusable delay and inconvenience that has been experienced during the past two years. When the first contract for the road was let, the Rapid Transit Commissioners were not in a position to dictate hard-and-fast terms to the contractors as to the length of time that the streets should remain open, and as to the absolute freedom of these streets from the storage of the supplies of material while construction was going on. The public must bear in mind that it was extremely difficult to secure a contractor who was willing to undertake this work under any conditions, and had the Commissioners laid it down that no material should be stored in the adjacent streets, that no derricks, compressing engines, or steam engines should be erected on the streets, it would have been quite impossible to let the contract. Now, however, with the experience gained, both by the engineers and contractors, it is possible to lay out the work and execute it with far less interference with public convenience than was possible four years ago. Thus, the contract that has been let for lower Broadway specifies that the work is not to be commenced until the whole of the necessary structural material is stored in the yards of the contractors either in this city or within easy reach of the work. Not only is the steel to be so stored, but the paving blocks and excavated material, as they are taken up, are to be carted away and stored until such time as the contractors are prepared to restore the streets to their former condition. No derricks will be permitted to be erected at street grade, but a platform will be built above the streets, resting on posts placed at the curb line, from which the whole of the work of hoisting excavated material and lowering structural steel, etc., will be carried on. While there will be a certain measure of inconvenience, it will be slight in comparison with that which has attended the work now nearing completion.

Agitation against a subway beneath Broadway is in any case premature, for the Rapid Transit Commission has not as yet decided on this route and, indeed, it is inclined to look with considerable favor upon the alternative route down Seventh Avenue. Among other reasons for this is the growing conviction that the first level beneath Broadway may be needed for other purposes. The time is approaching when it may be necessary to place the trolley car tracks in a subway, leaving the street surface entirely for vehicular traffic. This was done in Boston with most gratifying results, the congestion being at once relieved, and both the trolley car and vehicular traffic greatly accelerated. We would suggest to the merchants who may be affected by future developments, that the present case is not one for the lawyer, but for the engineer. The Rapid Transit Commission has given abundant proof that it has nothing but the interests of New York city as a whole at heart, and the merchants would do well if they selected some well-known engineer of wide experience and mature judgment, who, with their interests specially in mind, should investigate the whole question from an engineer's point of view, and then confer with the Rapid Transit Commission's engineers to determine what solution of the problem will best meet the interests of the city at large, and of the Broadway merchants in particular.

A DAY WITH THE "SHAMROCKS."

BY THE YACHTING EXPERT OF THE SCIENTIFIC AMERICAN.

In the closing days of the long series of tuning-up trials of "Shamrock III." off Sandy Hook, our yachting expert was invited by Sir Thomas Lipton to witness from the "Erin" a windward and leeward race between "Shamrock I." and the challenger. The kind courtesy thus extended proved to be particularly opportune for the reason that the conditions of wind and sea were just those which have prevailed on the large majority of the days when cup contests have taken place over the classic Sandy Hook course. There was a light but steady southeasterly breeze of from 6 to 8 knots strength which, except for the inevitable westering, as the day wore on, held fairly true throughout the race. Furthermore, the weather conditions were exactly those for which the challenger has been designed, and under which, when she has been in her proper trim, she has shown a marked superiority over "Shamrock I." The course was laid out ten miles to windward and return, and, in spite of a slight shift of the wind as the boats were nearing the outer mark, the first ten miles were sailed dead into the wind's eye, while the last leg, owing to a still further shift of the wind to the westward, was converted in the latter part of the run into a broad reach. In view of the unprecedented gains made by the new boat it should be carefully borne in mind that the two boats were equally favored by such changes in the strength and direction of the wind as took place; for, although the wind softened as "Shamrock I." turned the outer mark, it freshened considerably just as she crossed the finish line and thus enabled "Shamrock I." to cover the intervening three miles between herself and the line in much quicker time than she would otherwise have done. At the start the challenger crossed the line a few seconds after the gun, while the older boat by crossing nearly two minutes later secured a perfectly clear wind throughout the whole ten-mile beat to windward. From the very first the challenger began to show her weatherly qualities, lying somewhat closer than the older boat and footing considerably faster. Although the wind was so light that the lee rail of "Shamrock III." was at all times from a foot to 18 inches from the water, the small wetted surface, correct balance, and perfectly fitting sails of the boat got in their work to such good effect that the ten miles was covered in a little over an hour and a half, or at a speed of 8½ knots per hour through the water for the 13½ knots of distance that was actually covered. "Shamrock I.," in spite of the fact that she carried her largest club topsail as against the smallest club topsail which was carried on the challenger, was quite unable to hold her, and when the new boat turned the outer mark with an actual lead of 18 minutes and 2 seconds the old boat was fully 2 miles dead to leeward. The wind softened somewhat at this time, but an allowance of a couple of minutes would be ample to cover this disadvantage. As it was the challenger beat the old boat at the rate (unprecedented considering the strength and steadiness of the wind) of 1 minute and 48 seconds a mile. Even if we make the liberal allowance of 3 minutes for the lightening of the wind in the last two miles of the old boat's journey to the outer mark, there is still a credit of over a minute and a half a mile for "Shamrock III." In the homeward journey she added 4 minutes and 28 seconds to her lead, making a total gain for 20 miles of 22 minutes and 30 seconds. Had the whole 30-mile course been covered under the prevailing conditions, she would have won by 34 minutes and would have beaten the old boat to the outer mark by nearly half an hour. The full significance of these figures will be appreciated when we remember that the challenger was traveling at a speed which would have carried her over the 30-mile course nearly half an hour within the time limit of five hours in which the cup races must be finished.

During the last board to the outer mark the "Erin" was steered directly in the wake of the challenger and an excellent opportunity was afforded to study the set of her sails and the action of the boat through the water at the particular speed of 8 to 9 knots at which she was going. Regarding the former it was noticeable that for the light wind that prevailed the sheets were trimmed in very close, the main boom particularly being brought in until it was nearly amidships. The wake was surprisingly clean, and there was no visible evidence of drag, although, of course, that was scarcely to be looked for until higher speeds were reached. The convex lines of the boat seemed to be well adapted to taking the head seas which she encountered, and in this respect she showed to great advantage over "Shamrock II." which, with her flatter sections, pounded considerably harder than the new boat. It is pretty generally supposed that in "Shamrock III." Mr. Fife has designed a boat for light weather and the roll of the sea that is usually encountered off Sandy Hook, and it must be admitted that in this particular test she showed herself to be admirably adapted to these very conditions. As would be expected from her deep, round under-water body and her unusually large displacement, the scending and rolling of the boat were slow and rhythmical, and at no time did she show any of that tendency to slat the wind out of her sails which is one of the fatal weaknesses of the more shoal and beamy scow type of vessel. Mr. Iselin has stated that the only conditions under which he fears the "Shamrock" as a competitor are those of a light wind and a short sea; and certainly, the behavior of the challenger in this particular race and the effectual way in which she smothered her older sister would augur that the "Reliance" will meet a most formidable competitor whenever these conditions exist. Indeed, we are satisfied that the general estimate of the press that the defending yacht will score a sweeping victory of "three straight" in the coming contest is not borne out by a comparison of the actual performances of the rival craft. Any question as to whether the older boat was sailed to win was set at rest when her manager came aboard the "Erin;" for we have his assurance that on this, as on every occasion, everything was done to get the best speed out of the yacht. It simply was "not the old boat's weather."

In conversation with Mr. Fife subsequently of the race, we incidentally learned a fact regarding the tuning-up of the challenger which possesses great scientific interest, as proving how completely yacht designing had been emancipated from the rule-of-thumb methods of an earlier day. Mr. Fife informed us that the somewhat irregular performance of the yacht during the series of tuning-up trials of the past few weeks was due to the fact that several changes were made from time to time in the amount and trim of the loose ballast carried on the boat, with a view to the possible improvement of her speed. As the various combinations were tried it began to be evident that the best conditions for speed were those under which the boat was launched and under which she did such good work during her earliest trials on the Clyde; so true was this that in this last trial, in which she beat the old boat more decisively than ever before, every piece of ballast had been restored to the

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identical position which was allotted it on the original plans from which the boat was built. One could not ask for a more conclusive tribute to the accuracy of the scientific method of design than this.

While we are satisfied that the general belief that "Reliance" is certain to take every race is quite unwarranted by the facts, it must be remembered that the performance of "Shamrock" on this particular occasion can never be repeated in the stronger winds, that is, in any strength of wind that will drive the boat at a speed above that critical point at which wave-making due to big displacement becomes a more serious speed factor than reduced skin friction due to a limited area of wetted surface. Whether "Reliance" can beat "Shamrock III." in a wind of under 8 knots strength will only be known when the boats line up in a light sailing breeze off Sandy Hook; but her tuning-up trials would indicate that she will fail to do it. That she will leave her when the wind freshens to 12 knots and the bigger displacement of "Shamrock" begins to tell against the challenger is probable, but by no means certain; while in a wind of from 15 to 20 knots strength or over the more powerful and lighter-displacement "Reliance" should have the race in hand from the moment the two boats cross the line.

PRESENT STATUS OF AMERICAN SHIPBUILDING.

Very little of an encouraging nature concerning shipbuilding or the American merchant marine in the foreign trade of the United States is to be noted in this year's Blue Book of American Shipping, which is just from the press. Rather, indeed, is foreign shipping still dwindling, since no new vessels have been ordered for this service. The Blue Book is a statistical publication and also a directory well known in shipping and shipbuilding circles throughout the country. It contains as an introduction a careful review of prevailing conditions, the most surprising of which is that not a single contract has been let in the United States for a vessel for the foreign trade of the United States during the past two years. It is a curious anomaly that a country whose exports are unrivaled among the nations of the earth has not ordered the construction of a single ship in two years to carry away its freight. Could any one thing demonstrate more clearly than this the need of government aid for shipping? Why is this feature of our trade neglected? The ability to make things to export is aided by a tariff. Why not the carrier itself? Space in a ship is a commodity. It is something made to sell. The statistics of our export trade would be vastly enriched if there could be added to them the freight earned in transporting the manufactured products.

Except on the Great Lakes, where the industry is a special one protected by the coasting regulations, there is little encouraging to report regarding shipbuilding in the United States. During the fiscal year ended June 30 last, 1,536 vessels, of 456,076 gross tons, were built in the United States, compared with 1,657 vessels, of 473,981 gross tons, for the previous fiscal year. Vessels now under construction indicate a further lessened output for the coming fiscal year. The principal decrease for the past year has been in steel steamers built on the great lakes, which number 41, of 131,660 tons, compared with 52, of 161,797 tons, for the preceding year. The previous year was the one of greatest output in the lake district. On the seaboard only 18 ocean steel steamers, of 101,471 gross tons, were built—and this was the largest output of this type in our history. Nor were these all for oversea trade. Far from it. Only five of them can properly be credited to that service—the "Finland" for the Red Star Line, the "Massachusetts," "Mississippi" and "Maine" for the Atlantic Transport Line, and the "Siberia" for the Pacific Mail Steamship Company. The Red Star and Atlantic Transport lines are now controlled by the International Mercantile Marine Company. All these ships were ordered over two years ago, and there have been no new orders to fill the plans left vacant on the stocks. A few contracts have been received by the coast shipyards for some splendid vessels for the coastwise service. These include a side-wheel passenger steamer and a freight steamer for the Fall River Line, the former to cost $1,000,000 and the latter $400,000, and both to be built by the Fore River Ship and Engine Company, Quincy, Mass.; a 400-foot passenger and freight steamer for the Mallory Line, of New York, and a similar vessel for the Ocean Steamship Company, of Savannah, both to be built at the Roach Shipyard, Chester, Pa.; a 300-foot steamer for the Clyde Line, to be built by the Cramps, of Philadelphia; a steamer for the Eastern Steamship Company, to be about 350 feet long; two steamers for the Ericsson Line, each 203 feet long, all to be built by the Harlan & Hollingsworth Company, Wilmington, Del.; and four dredges for government service to be built by the Maryland Steel Company, Sparrow's Point, Md. These embrace all that are of any importance.

It might be pertinent to state, since so many laymen appear to be ignorant of it, that the coastwise trade of the United States and the foreign trade are two different things. The coastwise trade, meaning trade between United States ports, is a protected trade. Vessels of other flags may not engage in it. The past four years have marked a distinct wave of prosperity in shipbuilding for the coastwise trade; but the crest appears to have been reached, since new orders are not forthcoming.

Since the Spanish-American war naval contracts have been well distributed among the coast shipbuilders. During the year contracts for four battleships, two armored cruisers, and two gunboats have been given to them. Contracts for two more battleships are about to be given, and in addition the New York navy yard is building one battleship. Forty-one warships are at present under construction, representing a displacement of 338,948 tons, a total horse power of 415,500, and a cost for hulls and machinery of $90,314,516.

During the year the United States Shipbuilding Company was formed to take over the plants of the Union Iron Works, San Francisco; the Bath Iron Works and Hyde Windlass Company, Bath, Me.; the Eastern Shipbuilding Company, New London, Conn.; the Harlan & Hollingsworth Company, Wilmington, Del.; the Crescent Shipyard, Elizabethport, N. J.; the Canda Manufacturing Company, Carteret, N. J., and Samuel L. Moore & Sons, Elizabethport, N. J. Later the plant of the Bethlehem Steel Company was added, Mr. Charles M. Schwab transferring it to the shipbuilding company, though retaining an issue of $10,000,000 in bonds as an exclusive lien upon the property. In addition he received $20,000,000 in stock, equally divided between preferred and common. It was soon found that the shipbuilding company was capitalized far beyond its tangible assets and earning power, though the subsidiary plants themselves were in a thoroughly healthy condition. The inevitable result was failure to meet the fixed charges upon its sheaves of securities, and the court was under the necessity of nominating a receiver for it. The unfortunate plight of this company is no reflection whatever upon shipbuilding as a thoroughly sound and excellent business; it is merely another evidence of the folly of supposing that values are created by artificial means. A plant is worth no more than it can earn.

A forecast of shipbuilding on the great lakes does not show many orders in abeyance. A year ago the shipyards were filled up with orders for a full year ahead. But that is not the case now. The lake shipyards, broadly speaking, are now well up with their work. If they had to do so they could probably turn out all orders on hand within six months. Those best informed, however, do not take a dubious view of things on the Great Lakes. The industry, as stated before, is special; the ships are not like other ships; the shipping is not like other shipping; the freight carried is not so miscellaneous as oversea freight, but is confined to a few items in bulk. These items are likely to continue to be moved for years in a constantly ascending scale and ships will continue to be built to carry them. Moreover, a fair part of the existing tonnage on the lakes is wooden; it is old and decaying and must eventually be replaced by new and more modern carriers. Thus the permanence of shipbuilding on the lakes is assured for many years to come, although the number of orders for the coming year will fall considerably short of the business of any of the past three years.

THE NINTH INTERNATIONAL GEOLOGICAL CONGRESS.

The Ninth International Geological Congress is to hold its sessions in Vienna from the 20th to the 27th of this month, and the convention promises to be one of the most interesting in the history of the organization. The number of excursions offered in connection with the congress is very large. There were eight given before the sessions in Vienna began: In the palæozoic region of central Bohemia; in the cretaceous areas of Bohemia; to the hot springs (Carlsbad, etc.) and the regions of eruptive rocks in the north of Bohemia, and to the district about Brünn in Moravia; to the coal region of Ostrau and the environs of Cracovie and Wieliczka in Moravia; to the oil district of Galicia; to the region of the Carpathian "Klippes" and of the Tatra; to the environs of Salzburg and Salzkammergut, and to the palæozoic and tertiary terranes of Styria. The duration of these excursions was from eight to fourteen days and all were conducted by Austrian geologists who had made special studies in the regions concerned.

Seven minor excursions to places of geological interest in the vicinity of Vienna were on the programme for days during intervals in the meetings, while twelve extended excursions, likewise under the leadership of experts, are offered to the members of the congress for the weeks immediately succeeding the closing of the business sessions. The latter are to Buda-Pesth and to the Danube region in Hungary below the capital, to the Dolomites of the Tyrol, to the basin of the Adige in the Tyrol, to the western portion of the Hohe Tauern, to the central portion of the Hohe Tauern region, to Predazzo and Monzoni, to the Carnic and the Julian Alps, to the glacial beds of the Austrian Alps, to the glaciers of the Adige, to Dalmatia, and to Bosnia and Herziegovinia. All of the extended excursions are intended primarily for the benefit of the members who are making special studies of similar regions in their own countries, hence the number of those who can participate in a stated excursion is limited to enable the conductor to give personal attention to all.

The themes set for general discussion in the meetings of the congress are those which are of world-wide interest to geologists. Saturday, August 22, will be devoted to the consideration of the crystalline schists; Monday, to the cliffs and faults produced by the action of mountain-making forces, while on Wednesday there will be given a series of lectures on the geology of the Balkan peninsula, which presents many interesting problems in the science. The other sessions of the congress will be given up to lectures and discussions of various topics of general interest.

PROF. BARNARD'S OBSERVATIONS OF THE WHITE SPOT ON SATURN.

BY MARY PROCTOR.

In the SCIENTIFIC AMERICAN for August 1, 1903, a clipping taken from an article by W. F. Denning, in Nature, concerning the white spot on Saturn, refers briefly to Prof. E. E. Barnard's observations, which were as follows:

Prof. Barnard had observed Saturn frequently for some twenty-five years, but had never seen any marking by which the rotation period of the planet could be determined; that is, he had never seen any definite spot whose motion could be detected. On June 15 a large white spot was visible, following the central meridian of the planet, but daylight did not permit an observation of its transit across the central meridian of Saturn.

On the morning of June 24, it was again observed with the 40-inch telescope (at the Yerkes Observatory), and its transit carefully determined to be at 3h. 42m. central standard time. The spot was strikingly distinct, and lay some three seconds of arc north of the Saturnian equator. Its motion was very noticeable during the time it was under observation.

It has been subsequently observed, and seems not to be so noticeable as at the first observation. Prof. Barnard hopes to obtain a good set of observations of it, for a redetermination of the rotation period of Saturn. These spots on the planet are rare, the last conspicuous one of the kind having been observed by Prof. Hall at Washington, in 1876, from which he determined the period of Saturn, which had not been determined since the time of the elder Herschel.

Since 1876, faint spots have been reported by several observers, for which periods approximating to that determined by Hall were obtained, but they were too elusive for general observation. In Astronomische Nachrichten, No. 388, we are informed that upon receiving the announcement of Prof. Barnard's observations of the white spot, Hartwig at Bamberg, Germany, made observations of it on June 26, when it transited at 14h. 20m., Bamberg mean time.

Later observations by Prof. Barnard prove that the period of the planet Saturn is 10h. and 39m., which is 25m. longer than the period derived by Hall from the white spot of 1876.

A NEW GOLD DISTRICT.

In the Lake Arkell district, 120 miles from White Horse, and 20 miles from the Yukon River, new placer mines are being worked, which promise to be fully as rich as the Klondike region. Prospectors were rushing to the country before the original discoverers had succeeded in staking out two or three claims. It is said that surface dirt yields 15 cents to the pan. Every man who can leave is joining the rush from Dawson, White Horse, and Skagway.

THE CURRENT SUPPLEMENT.

The process invented by the late Dr. Ludwig Mond for manufacturing illuminating and power gas from coal slack is described in the opening article of the current SUPPLEMENT No. 1441. Another technological article of interest bears the title "Manufactured Marble." In the last number of the SUPPLEMENT the contact process of manufacturing sulphuric acid was historically considered. In the present number the actual manufacturing process is described. George C. Husman tells how unfermented grape juice can be made at home, and how it should be used. Inventors will doubtless read with interest the article bearing the title "The 'State of the Art' in Patent Cases." Charles Richards Dodge tells something of the volcano of Colima The manufacture and employment of gas from heavy oil in Germany is fully described. Dr. Emmell reviews the present methods of producing bronze colors.

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AN INSTRUMENT FOR DESCRIBING MATHEMATICAL CURVES.

BY F. N. MASSA.

In the SCIENTIFIC AMERICAN SUPPLEMENT No. 1302 will be found a description of an apparatus called by its inventor, Father Deshevrens, a "campylograph," which is designed for drawing every imaginable geometrical figure, as well as simple and complicated algebraic curves. I have designed a somewhat similar instrument based on like general principles, but very different in construction. Of the two photographs herewith reproduced, the one is a plan view and the other a perspective view of my campylograph. Broadly speaking, the apparatus may be described as a train of wheels by which two guide wheels and two paper-bearing disks are rotated.

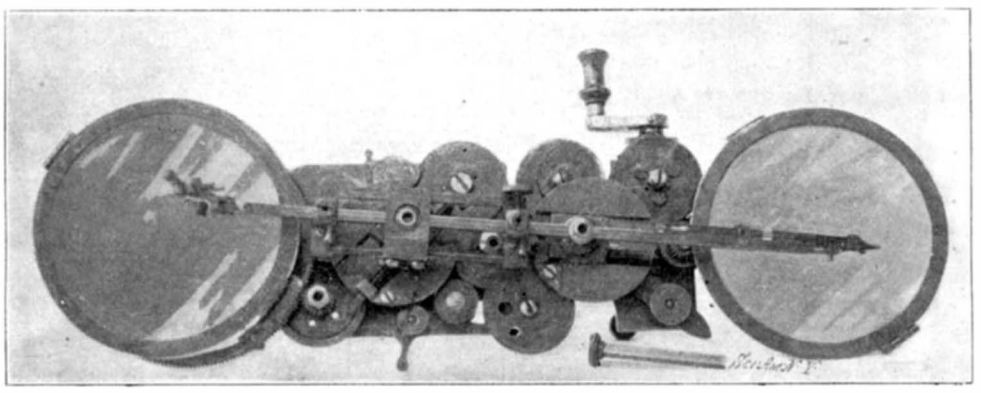
Although the pictures herewith reproduced are not lettered, their details are so clear that the various wheels may be designated by imaginary letters for the sake of easy reference. When paired wheels are mentioned, the letter indicating the upper wheel comes first and the large or small letter indicates the larger or smaller wheel of such pair.

Three wheels are in line centrally from right to left, which may be designated by the letters *A*, *B*, *C*. The wheels *A* and *B* are never in direct gear. The wheel *C* is mounted on a sliding plate and may or may not mesh with the wheel *B*. The wheel *A* is operatively connected with the wheel *B* by either of two pairs of wheels mounted on the arms of a forked lever, turning on the axis of the wheel *A*. One wheel of each pair is always in mesh with the wheel *A*. When the pair nearest the operator is thrown into mesh with the wheel *B*, that wheel turns at half the speed of the wheel *A*. This pair of wheels may be designated by the letters *D*, *d*. When the other pair, which may be designated *E*, *e*, is thrown in mesh with the wheel *B*, that wheel has twice the speed of the wheel *A*. When the wheel *C* carried on the sliding plate is thrown into gear directly with the wheel *B*, the speed of the two is equal. In these cases the direction of rotation of the wheels *A*, *C* is contrary. They may, however, be made to turn in the same direction by reversing wheels, one of which is always in mesh with the wheel *B*. This wheel, which is always connected with the wheel *B*, may connect the wheel *d* with the wheel *B*, or, when the wheel *C* is slid away, it may connect the wheels *B* and *C* with each other. Opposite the wheel *B* is another pair of wheels, mounted on an eccentric axis or stud, with a considerable latitude of motion for position. This pair of wheels, which may be designated as *F*, *f*, may connect the wheel *B* with the wheel *C*, or the wheel *B* with the other reverser, which is thereupon set into gear with the wheel *C*. When the connection is (*A e*), (*E B*), (*E f*), (*C*), then the wheel *C* turns four times for every revolution of *A*. When the connection, however, is (*A*), (*D d*), (*B*), (*F f*), (*C*), then the wheels *A* and *C* move in unison.

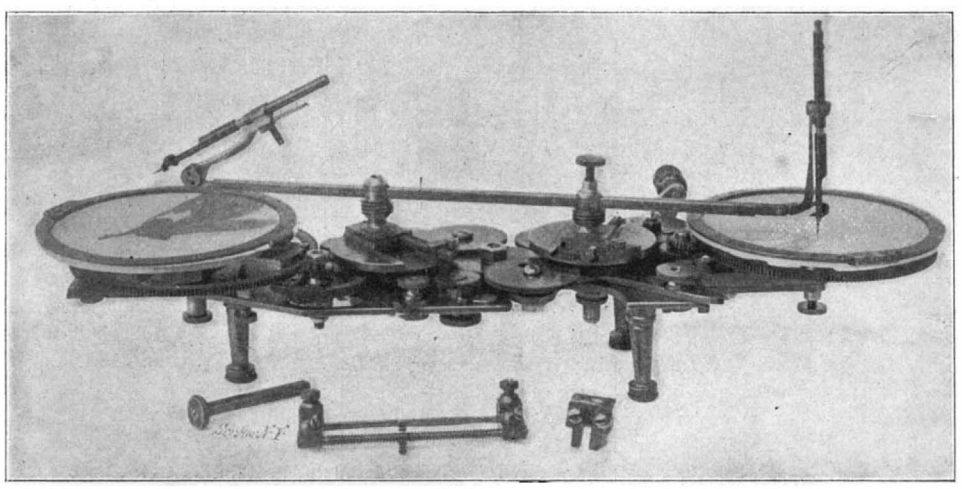
On the wheels *A* and *C* disks are fixed having eccentric slides moved by screws. Short studs are fixed on these slides, which studs are bored with taper sockets, and carry at their upper ends short screws. In the sockets, pen-heads are mounted to turn freely. The heads are pierced with square holes, through which a square pen-rod passes. When set as indicated in the perspective view, the pen will repeat over the same path. By loosening the fixing screw, the rod can be moved endwise and again fixed, so that the pen will describe a parallel figure. A spiral character can be given to any curve by the appliance which is shown attached in the top plan view and detached in the perspective view. A slotted block, also shown, fits either pen head. When the spiral frame is set in position, the slotted block detains from traversing a wheel driven by the worm on the pen-head socket, but leaves it free to turn on the screw fixed in the frame. Consequently the frame, and with it the pen-rod, traverses, making the figure continuously larger or smaller. Lines can be drawn on an elliptical path by an ellipse chuck under the left-hand disk. By varying the eccentricities of the pen-heads on the wheels *A* and *C*, the relative velocities, or the position of the pen on paper, any number of different kinds of figures can be automatically traced.

Within the range of this instrument are all the figures of a one-part geometric chuck, and others quite beyond the scope of that instrument in its more complicated forms.

The campylograph, made with a view to easy portability, is very small. The train wheels are of 100 diameter pitch, and the larger 48 diameter pitch, as are several pinions used to change the relative velocity of these wheels.



A PLAN VIEW OF THE CAMPYLOGRAPH.

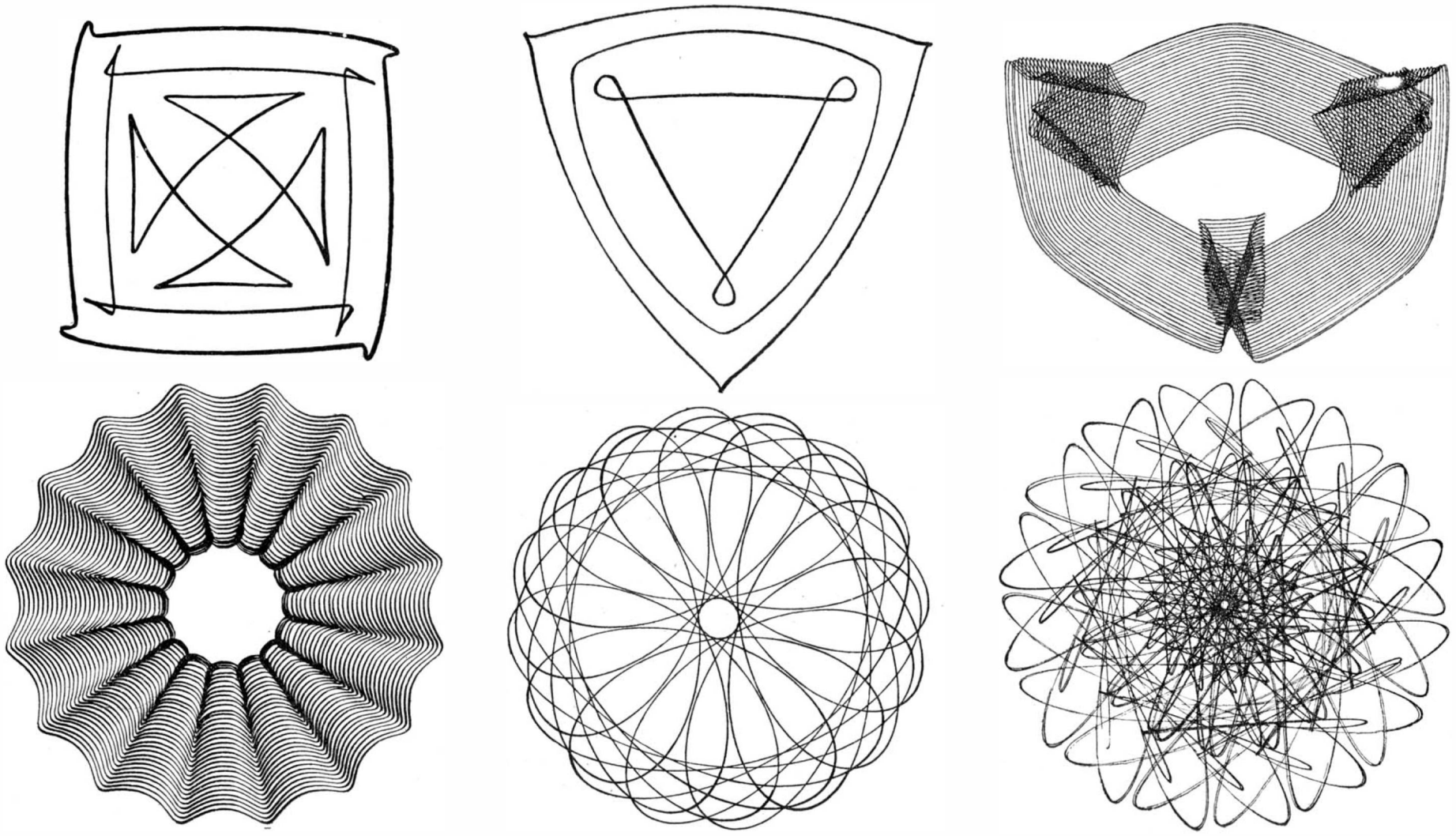


A PERSPECTIVE VIEW OF THE CAMPYLOGRAPH.

The Wireless Congress.

The Wireless Congress at Berlin, the result of an invitation extended by Germany last year with the avowed purpose of agreeing on international regulations to control the operation of wireless telegraphy systems, and to prevent any one system from getting a monopoly and rendering the employment of other systems impossible, was opened on August 6. The congress does not contemplate the adoption of any binding agreements between the powers, but intends simply to institute a preliminary discussion for the purpose of clearing up the situation for further action. A future congress may, perhaps, be convened, clothed with treaty-making powers.

The number of employes of the railways of the United States at the close of last year was 1,189,315, an increase for the year of 118,146.



GEOMETRIC FIGURES AUTOMATICALLY DESCRIBED BY THE CAMPYLOGRAPH.

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AN AUDIBLE AND VISIBLE RAILWAY SIGNAL FOR GRADE CROSSINGS, OPERATED BY A HIGH TENSION CURRENT.

BY EMILE GUARINI.

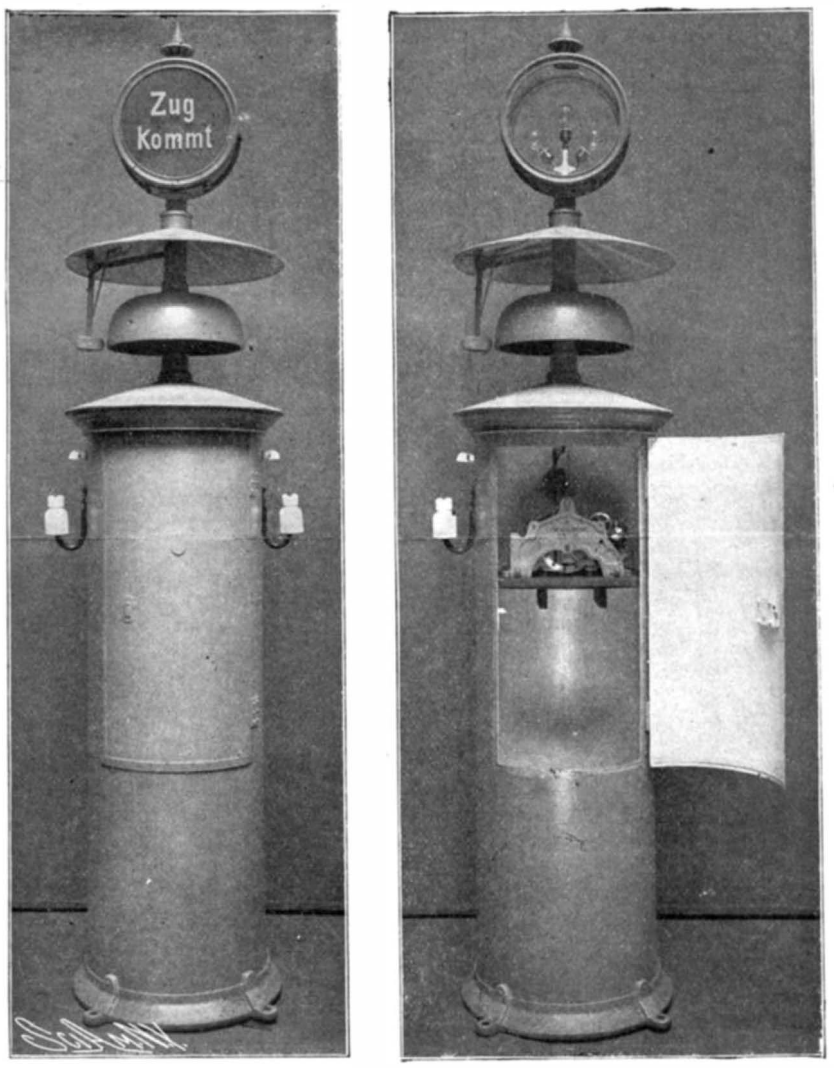
Among the novelties recently introduced by Siemens & Halske, of Berlin, is a new system of alarm signals for railway crossings at grade. The signals are both visible and audible.

Upon a single-tracked road running from Paderborn to Brackwede, the device was set up and tested, giving satisfactory results since its installation. The apparatus is automatic, and in general resembles ordinary signals exteriorly, but it contains within its iron envelope a small high-speed electric motor which, by means of a rack, actuates a hammer that strikes a bell.

To avoid the use of resistances in reducing the tension of the current from 500 volts to something more suitable for the motor, incandescent lamps are cut in the circuit. Thus it happens that the audible signal receives a complement by the addition of a visible one. Three of the four lamps are placed in the lantern which ornaments the top of the apparatus situated at the danger point or point of crossing, while the fourth lamp is set up in the nearest station and serves to inform the station agent that the appliance is doing its duty properly.

Lamps of 16-candle power are used for this purpose. When the lamps are illumined, there appear upon the face of the lantern the words, "Zug kommt" (train is coming), which under other conditions are invisible.

One of our views shows the apparatus closed and in working order; the other furnishes a detailed view of the motor and lamps. The cutting into the electric circuit of the automatic motor is accomplished by the approaching train through the medium of three contacts placed at suitable intervals on the track. In passing over the first contact the alarm is set in motion and the sign "Zug kommt" illuminated. The passage of the train over the second contact cuts out the alarm and illuminated sign, and when the wheels of the train pass over the third contact after passing the crossing, the parts of the mechanism are returned to their state of rest or normal position; the lamp at the station is extinguished and the commutator takes up again its original position.



A NEW RAILWAY SIGNAL.

WATERWAY IMPROVEMENT ON THE OHIO.

BY WILLIAM GILBERT IRWIN.

One of the most interesting phases of the marvelous development of our internal commerce during the past ten or twenty years has been the growing importance of the Ohio and its tributaries, the Ohio and Mississippi to-day forming the greatest internal waterway system in the world, with the possible exception of that formed by the Great Lakes. This rapid development of the Ohio as a carrier of commerce has been largely due to the great industrial development which the Ohio Valley has been undergoing during the past ten or twenty years. Just as the Upper Ohio Valley is to-day the center of the iron and steel trade of the world, and at the same time the greatest producer of coal and coke, so, too, does the vast amount of traffic which has brought this stream to the front rank among the internal waterways of the world originate in the Upper Ohio Valley—Pittsburg and adjacent sections embraced in the Pittsburg district, together with southern Ohio and the northern part of West Virginia, contributing the major portion of those varied commercial products which give the Ohio a vast annual traffic. The Pittsburg district to-day possesses more industrial superlatives than are to be found on any other similar area on earth. This district has the greatest iron and steel works, the greatest electrical plants, the largest glass houses, firebrick yards, potteries, etc., and at the same time is the center of the world's greatest coal and coking fields.

Save for the shipping facilities afforded by the Ohio, all the vast traffic radiating out from this district is marketed by way of the railroads. Consequently Pittsburg has become the greatest center of railway traffic on the globe, the various roads entering this city being continually congested with the great volume of traffic. They are the best paying ones in operation. There was a time when the railway interests were opposed to the improvement of the Ohio with a view to making it a commercial stream, but long ago such opposition has disappeared, and it is now fully realized that the vast traffic of this district necessitates other than railway facilities for its handling.

While the Ohio has been utilized for transportation purposes to some extent from the earliest days, yet until a comparatively recent period, and even at the present day, this commercial highway has not been improved to that state which those interested in this form of traffic have desired. But what has already been accomplished has been responsible for making Pittsburg, although wholly an inland city, the fifth commercial port in this country in point of tonnage, its annual river traffic being exceeded only by New York, Baltimore, Chicago, and Buffalo. With Pittsburg the fifth commercial port of this country under the present circumstances, when the Ohio and its tributary streams are open to navigation only about eight months in the year, some conception can be formed of what benefits will be conferred on this city when an all-year-round shipping stage is established on the Ohio, and when the government dams and locks are enlarged to accommodate the great freight steamers which are now being constructed for this traffic.

The navigable course of the Ohio extends from Pittsburg to the Mississippi, a distance of nearly 1,000 miles. The Monongahela is navigable a distance of about 150 miles above Pittsburg, and the Allegheny, which with the Monongahela forms the Ohio, is at present navigable about thirty miles above Pittsburg, while improvements under way and contemplated will give that stream more than one hundred miles of navigable waters. The Muskingum in Ohio contributes 75 miles of navigable waters to the Ohio River system. In West Virginia the Kanawha is navigable for 150 miles, the Little Kanawha for 102 miles, and the Big Sandy for 50 miles. The erection of government dams and locks will add more than a hundred miles of navigable waters to these streams. The White River in Indiana is navigable for 50 miles, and in Kentucky the Ohio has in the Green, Kentucky, Tennessee, and Cumberland navigable tributaries with an aggregate length of more than 1,200 miles. The Ohio-Mississippi system from Pittsburg to New Orleans has a length of about 1,400 miles, and the navigable tributaries of the Ohio have an aggregate length of more than 1,800 miles, giving this internal waterway a length of more than 3,200 miles, while improvements now under way or provided for by the government will add probably 300 miles of navigable waters, and within a few years this work will have established an all-year navigation stage on the Ohio throughout its entire course.

The improvements on the Ohio up to this time consist of eighteen locks and dams, a number of which are not yet completed, and the Louisville and Portland Canal around the Falls of the Ohio at Louisville. This canal is 2 miles long, and was completed in 1881. It carries a mean annual stage of 12 feet, giving passage to the largest vessels now afloat on the Ohio. The locks are equipped with automatic gates electrically operated, and a traffic of nearly 10,000,000 tons annually passes through the canal, the lockages last year aggregating nearly 8,000. All the dams in operation and building on the Ohio are of the movable type, the Davis Island dam at Pittsburg, which was completed in 1885, being the first dam of that type ever built in this country. This dam is of the wicket pattern, the wickets being lowered at times of high water, leaving an unimpeded channel. A very full description of the mechanism of a very similar movable dam was given in a former number of our SUPPLEMENT. The dam consists of a number of wickets, each supported, when raised, by a prop which catches at the bottom in a step of a hurter.

Coal Fleets at Pittsburg Ready to Start Down the Ohio River.

WATERWAY IMPROVEMENT ON THE OHIO RIVER.

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The dam is shown in this position. When the wickets are to be lowered, the prop is pulled forward out of its step and into another step. The weight of the wickets is then allowed to press on the prop, and, owing to the construction of the second step, the prop strides down past the first and the wicket is lowered. The arrangements are such that the current aids in effecting this lowering of the wickets, and holds them in position when lowered. They are shown in this state in our engraving.

The wickets are hinged a little above their center, at the point where the prop supports them. The effect of this arrangement is that in low water the pressure keeps the dam closed, while in high water the current tilts the wickets, allowing water to flow through underneath them, and at the same time deepening the channel above. Thus an automatic regulation of the flow is insured. Power for working the locks and the wickets is supplied by steam or electricity from a power house on the river bank near the lock.

Government work on the Ohio began as early as 1825, and since that time the expenditures in the way of building dams and locks, dredging, snagging, harbor work, etc., have aggregated about $40,000,000, including the improvements made on the tributaries of the Ohio. Of the eighteen dams to be constructed on the Ohio nine only have been completed, and on a number of these much work remains to be done before they will be wholly adequate to fulfill the purpose for which they are intended. All the locks on the river have a depth of at least 8 feet above the sills, and a width of 100 feet. The aggregate tonnage carried on the Ohio last year amounted to 14,054,322 tons, and the passenger steamers carried 3,881,582 passengers during the same time. Some idea of the commercial importance of this stream will be obtained when it is known that the government has already expended more than $50,000,000 in improving the Missouri, which has an annual tonnage aggregating little more than half a million tons, the Ohio contributing more than three-fourths of all the tonnage which is carried on the lower course of the Mississippi.

The principal item in the commerce of the Ohio is coal, which is now shipped by water in large quantities from West Virginia, as well as from the Pittsburg district. As early as 1802 a vessel laden with coal at Pittsburg was sent by way of the Ohio, Mississippi, Gulf, and Atlantic to Havre, and ever since that time coal carrying on the Ohio has been an important commerce. Before the opening of the last century Pittsburg coal was sent down the Ohio on keel-boats; later the product was marketed by flat-boats, and since the introduction of steamboating on these waters the coal traffic has assumed marvelous proportions. By way of the Monongahela, which has been improved by the construction of nine locks and dams, with five others now building, something like 10,000,000 tons of coal are taken down to Pittsburg. Part of this is for local consumption, but the bulk is there made up in fleets for shipment to New Orleans and Gulf ports. The improvements now under way, and those proposed and provided for by government appropriation, will extend the navigable course of that stream into the Fairmont coal field and West Virginia and a vast tonnage will be thus added to the Monongahela and Ohio rivers. Last year there were more than 42,000 lockages at the nine locks on the Monongahela.

Already the improvement of the Monongahela has made that valley one of the greatest parts of the Pittsburg district. Innumerable great iron and steel manufacturing concerns are now operating great plants in the valley. This same effect is now being felt in the Allegheny Valley, and from Pittsburg to Cincinnati the Ohio Valley is one great manufacturing district, a fact due in the largest degree to this internal waterway improvement. Last year Allegheny County, of which Pittsburg is the center, and which does not embrace all the Pittsburg district, produced more than one-third of all kinds of finished iron and steel products, and an equally high percentage of the non-finished iron and steel turned out in this country, which fact reflects some of the advantages wrought to this section through the water facilities provided by nature and improved by the ingenuity of man.

Since the development of the bituminous coal mining, Pennsylvania, Illinois, West Virginia, and Ohio, which largely make up the 210,000 square miles of territory drained by the Ohio and its tributaries, have held the front rank in this industry, while Indiana and Kentucky have also been important coal-producing States. The combined production of the Ohio Valley States in bituminous coal last year was 165,000,000 tons, or nearly four-fifths of the entire production of this country. With the vast resources of the universal industrial fuel upon which these States are able to draw, some idea can be formed of the phenomenal development of the coal traffic on the Ohio and its tributaries which must take place within a few years, when the improvements now under way have rendered this stream navigable all the year round and have extended navigation to numerous streams now of little commercial importance.

Radium and Helium.

The following paragraph appeared in the London Times of July 20:

A paper bearing in a remarkable way on the connection between these two elements, which is now exciting so much interest, has been received for publication by the Royal Society from Sir W. and Lady Huggins. Prompted, in fact, by theoretical ideas, they attacked the problem of the spectroscopic analysis of the light emitted directly by a radium salt at ordinary temperatures. Preliminary visual observation seemed to show traces of bright lines in a continuous spectrum. Preparations were accordingly made for photographic record by means of a small quartz spectroscope constructed some years ago for us on very faint celestial objects. After several trials, a spectrum consisting of eight definite bright lines in the ultra-violet, entirely different from the spark spectrum of radium, and some faint lines together with a very faint continuous spectrum, was obtained by seventy-two hours' exposure to the glow. The lines were of some breadth, on account of the wide slit that had to be employed in order to admit sufficient light; but it was found possible to measure their wave-lengths within an error of two in the fourth figure. On a comparison of this spectrum, so different in type from an ordinary phosphorescent spectrum, with the recorded measurements for helium, it appeared at once that four, and perhaps five, of the eight lines agreed with lines of helium within the uncertainty of the measurements. Another line, that of highest refrangibility, agrees with a line in the spark spectrum of radium itself, which, however, has not been recorded by other observers; the two other lines, the lowest, have not yet been traced.

It will be remembered that last year Prof. Rutherford produced striking evidence for the view that, in the very slow break-up of radium that is concomitant with its radio-activity, the inert gas helium is one of the products formed. Recently, Sir W. Ramsay and Mr. F. Soddy have succeeded in detecting helium by the spectroscope in the gases extracted from a radium salt. If, as the present observations indicate, the radium salt shines spontaneously in the dark largely by light belonging to the different element helium, another important step is gained in elucidating the nature of the instability of such chemical elements of high atomic weight and the radio-activity associated with it.

A New Development of the Radium Mystery.

Speaking at the dinner of the Society of Chemical Industry at Bradford, on July 16, Sir William Ramsay, president, described a new development of the radium mystery.

For some time, he said, two very distinguished young scientists belonging to Canada—Prof. Rutherford, of Montreal, and Mr. Soddy, who was now working in his laboratory—had been investigating the properties of those mysterious elements which had the power of discharging an electroscope when they were brought near it. His audience was aware, no doubt, that that property was first discovered for uranium by M. Becquerel, of Paris, and not long afterward Mme. Curie discovered the wonderful element, radium. Messrs. Rutherford and Soddy discovered that thorium, an element not far removed from radium and uranium, gave off what they called an emanation, or what might be called a gas—a substance that could be moved from place to place, which could be condensed by cooling at a sufficiently low temperature, but which was most remarkable as a substance which discharged a loaded electroscope, and also as a substance which shone in the dark. They pointed out that radium gave out a similar emanation or gas continuously, that any salt of radium—radium bromide was what was generally used—but any salt of radium if allowed to stand for a while accumulated a further quantity of gas which could be removed with a pump or by washing it out with another gas. This very curious substance lost its properties on standing. If it was allowed to remain for four days it had parted with half its power to discharge an electroscope, and became, if looked at in the dark—as far as one could judge by the eye—half as luminous. And as time went on it lost its power of discharging electricity, and also its luminosity, until at length there was nothing left. There appeared to be no residue as far as one could tell. Mr. Soddy had done him the honor of coming and working in his laboratory, and as he (the speaker) had had some little experience in dealing with small quantities of gas, they laid their heads together, and had contrived to examine this emanation or gas given off by radium. He might tell those who did not know, that radium was very expensive, because it was a very rare substance, and that $125 would buy a very small quantity indeed—less than one grain. They managed to scrape together the needful, and invested in as much radium as they could get—all there was in the market at the present moment.

"Having examined this gas," Sir William continued, "we found, to our astonishment, the other day that the emanation contains a quantity of helium, a light constituent of the atmosphere. I don't wish to imply that the emanation is helium, for it is not. The gas was first passed through a tube cooled with liquid air, in which the emanation stays behind, being condensed at that low temperature. But the other gas passes through this cold tube, and when collected in a microscopic Plücker tube—what we call a vacuum tube—it shows undoubtedly the whole spectrum of helium (applause). It is impossible to forecast what this implies, but you must remember that the radium bromide which we have obtained, prepared, no doubt, by the same process which the Curies used, namely, the decomposition of pitchblende, a uranium mineral, with precipitation of barium by means of sulphuric acid, and with it radium, and separation of radium from barium by fractional crystallization—that this radium obtained from pitchblende can hardly be supposed to have retained any helium through all those manifold operations. And it would follow that the helium must be generated from the radium or from the gas—the emanation—which the radium gives off. At present I am as much in the dark about it as any one. I merely chronicle the fact that there is undoubtedly a production of helium continuously from radium."—Chemical News.

A Statue to Ericsson.

The hundredth anniversary of the birth of John Ericsson was celebrated in New York by the unveiling of a statue in Battery Park. The statue is the work of John Scott Hartley, and was unveiled by his daughter. As the flags fell away, the United States gunboat "Dolphin," which was anchored in the harbor, fired the national salute of twenty-one guns, and a folk-song from the birthplace of Ericsson was played by a Swedish band. Mayor Low, of New York, in his address of acceptance said:

"It is a singular coincidence that one of my name should have the privilege, as Mayor of New York, of receiving on behalf of the city a statue of Ericsson, for the historic 'Monitor,' designed by him, which revolutionized the navies of the world, was towed to Hampton Roads for her fight with the 'Merrimac' by a boat called the 'Seth Low.' This boat, like myself, was named for my grandfather, and it belonged to the firm which for many years towed all the clipper ships of my father's fleet in and out of the harbor. When it is recalled that the 'Monitor' was designed in New York, that she was built in New York, that her engines and her turret were made here, New York may well rejoice to give an honored place to a statue of the great engineer to whom the city owes this signal deliverance.

"Well may Ericsson's statue stand here in Battery Park, where it shall ever overlook the waters of the proud harbor which his genius did so much to develop. The beat of every propeller that lashes the waters into foam will bring to him its song of praise, and the incoming and outgoing tides as they pass this spot will shout in turn the chant of the world-encircling oceans as they pay tribute to the memory of him whose mastery the waters of the deep recognize to earth's remotest sea."

Forty-two Swedish-American societies of New York and its vicinity celebrated the unveiling of the statue.

German Association of Inventors.

The Central Association of Inventors "Germania," of Bayreuth, will hold a general exhibition at Nuremberg during September and October of this year for the purpose of facilitating the sale of patents and copyrighted patterns. There are more than 200,000 copyrighted patterns in Germany and over 140,000 patents; one-half of these, however, are not in public use, for the reason that the inventors were not able to exploit their inventions. On account of this, the Central Association was formed a few years ago. Its purpose is to assist the members to make their inventions profitable to themselves, as it is a well-known fact that a majority of inventors have not the means to do so. The association furnishes space to inventors without means free of cost and charges no fees for effecting a sale.

We learn from a contribution of Mr. E. Fournier d'Albe to the Electrician that Mr. R. J. Strutt has discovered that a radioactive gas or emanation can be obtained by drawing air over hot copper, or by bubbling it through hot or cold mercury. By repeated circulation through mercury very considerable activity of quite a different order from that of metals as ordinarily observed can be obtained. The mercury emanation deposits radioactive matter on the walls of the vessel. This deposit remains after blowing out the gas, and possesses at first, perhaps, one-sixth of the activity of the latter. This induced activity falls to half value in twenty minutes. The emanation itself decays in activity according to an exponential law, falling to half value in about three days.

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Correspondence.

Lessons from a Railroad Wreck.

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN for July 4, 1903, there are four unusually instructive views of a railroad wreck. These engravings, reproduced from photographs, show the positions of three cars after having rolled down an embankment at a speed of thirty-five miles per hour. In one respect, it was an easy wreck, because the cars were not dragged along the ties in such a way as to strip the trucks from the body. In fact, steps, air and gas cylinders and even brake rods are left intact. The strength of any good car body is such that it ought, having a fair opportunity, to roll over and over down an embankment like that shown for fifty or sixty feet without serious damage.

In general, destruction in such wrecks is found inside the coach, as may be seen from the interior view, where the wreck of the chairs is astonishing. They not only parted company with the seats, but were torn bodily from the floor.

The interior fitting of a car is often objectionable because of the return to an old fashion of elaborate brasswork, abounding with sharp angles and points. It has often happened that passengers have been seriously injured, where a car has rolled over and over, through coming in contact with the interior bronze or brass work. In a wreck like the one mentioned, bruises would be probable, but, had the seats remained intact and the brass work been suitably designed with rounded corners and smooth curves, there should have been no one seriously injured. With a properly designed coach of modern construction, telescoping is practically impossible. The end frame of the car is so strengthened from floor to roof by heavy bars, that the car would yield bodily before it could be penetrated. The real danger to the passenger is found in the lamps, baggage racks, seat arms, etc., against which he is liable to be thrown. W. E. P.

Uses of Superheated Steam.

To the Editor of the SCIENTIFIC AMERICAN:

In your number of December 27, 1902, I found an interesting article by Mr. Foster on superheating of steam; but his conclusion is wrong where he gives other uses for superheated steam, such as for boiling and distilling apparatus.

A short time ago I had the same opinion until I read that in Germany was made the same proposition and on that occasion Dr. Claassen published a report of tests made in this direction with negative results. With the purpose of enlarging our own evaporating plant on this principle and to convince myself I made a series of tests with a little evaporating apparatus to find what results I could obtain by using superheated exhaust steam, such as is always used in Java in sugar factories for boiling and evaporating cane juice.

After a great deal of trouble I found that superheated steam never will be introduced successfully on this line of evaporating.

I fear very few people interested in evaporation will believe on first sight that *wet or saturated exhaust* steam of, for example, 7½ pounds pressure and ± 110 deg. C. temperature, *and superheated* steam of 7½ pounds pressure but with temperature of 140 deg. to 160 deg. or even 180 deg. C. will do nearly the same amount of evaporation. Don't forget, however, that if superheated exhaust steam has 7½ pounds pressure, the initial pressure is far less.

In the tests I made there was a difference of about 2 pounds in back pressure on the engine in superheating to absolute dryness, which I reached at about 140 deg. C. By the use of this absolute dry steam there was a remarkably quicker evaporation, but comparison of the results obtained with saturated steam of 2 pounds more pressure (this means the same back pressure on the engines for both cases) showed no gain, and therefore I believe you could obtain the same results without a costly superheating apparatus by simply augmenting the back pressure on your engines to the same pressure as the absolute dry superheated exhaust steam would have. A low superheating on low pressures, such as 2, 3, or 5 deg. C. and 1 to 5 pounds pressure showed particularly badly and the results are only one-third to one-half in evaporating quality of that with wet or saturated exhaust steam.

The amount of work done in evaporating or boiling plants of our kind is proportional to the heat corresponding with the pressure of the steam.

DEKKER,
Peterongan, Java. Engineer Sugar Estate.

The New Australian Patent Bill.

To the Editor of the SCIENTIFIC AMERICAN:

Among the first beneficial fruits of the Australian Commonwealth, patent legislation must take high rank, and I am pleased to be able to inform you that a bill containing many excellent features was on June 26 last introduced into the Senate and read the first time, dealing with this important subject, a copy of which I have the honor to forward you as soon as received by me from the government printer.

There can be little doubt that the bill will be carried in such form as to open up a new industrial era on this continent, and attract capital, and men of great enterprise and extensive experience in manufacturing pursuits, so that there will be born a period of prosperity in marked contrast to the stagnation which has affected the various Australian states for years past during their term of individual and sadly defective patent laws.

By the expert eye it will be seen that the bill in many respects is studiously moderate, while recognizing the principle which is so successful in Canada and over most of the European countries, that those foreigners who look for the large rewards which patents on successful inventions give, must not forget the claims of the people from whom those rewards are obtained to the manufacture of the patented article in the commonwealth within a reasonable period and under reasonable circumstances.

In these directions the Australian provisions are immensely more lenient to foreigners than those of Canada, France, Germany, Italy, Austria, Hungary, and many other foreign countries. There are defects in the bill, obviously enough, and I have no doubt some of these will be removed.

The idea has been mooted in the press that the government is of opinion that either from America or England a gentleman having those high attainments which would fit him to take the position of commissioner of patents in Australia, should be secured. I sincerely hope applications will be made at once by eligible persons who might, if in England, get some hints from the agent-general as to procedure, or in America by putting the consular service in motion.

It cannot be doubted that color exists for the notion that much of the stagnation and inefficiency of our patent offices has been directly due to the extraordinarily weak and often incapable management by former heads of the various patent offices here, vividly contrasting with the skill, energy, and patriotism exhibited by the commissioners of patents in the United States and elsewhere. Of the present heads I do not speak.

If an Australian gentleman is appointed, the administration of the act may not be nearly so successful as it might otherwise be, judging from the past.

The post is one which one (in many respects very worthy) aspirant for the position states to me he would not accept under from $6,000 to $7,500 per annum, and there can be no doubt whatever that in accordance with the practice of Australia of paying high salaries, whatever the salary may begin with it will certainly become a decidedly high one if the office is only filled by an energetic and capable administrator, such as the various patent office commissioners of the United States and the comptrollers of Great Britain have proved themselves to be. Of course no lawyer or engineer in Australia, however willing to do his best, can have had the enormously valuable experience of organization and routine those countries provide; and though those here seeking the position include several personal friends, and will receive every assistance from me if appointed, yet I sincerely hope the post will, in the industrial interests of Australia as a whole, fall to some one having those greater advantages, which obviously can only be obtained from abroad.

I hope to be able to devote a large amount of time hereafter, even at a sacrifice of private engagements, to promoting improvements in the patent bill, and to be as unremitting as I have been in the past in seeking to raise administration to a high level, and if you would be interested in further communications from me on the subject I should have pleasure in making a note of it.

Some petitions to Parliament for patent law improvements, which I some time ago originated, received over 1,000 signatures, including all the leading manufacturers and importers to whom they were submitted, and it is gratifying to note that the new bill recognizes some of the most important of the desires the petitioners expressed, so curing evils in existing legislation. G. G. TURRI.

Melbourne, Australia.

William E. Parker, who has been connected with the Texas and Pacific Railroad for many years, has recently invented and patented a cattle guard which has some novel features. It has been tried on that line and found to be very effective. The guard is a simple system of small wheels about four inches in diameter and a half an inch thick mounted on many axles and bound together by straps of iron. Cattle attempting to cross this arrangement find that they are unable to obtain a footing, and turn back. In a recent trial it was found that after an attempt had once been made by an animal to cross it, it was impossible to drive the animal over the guard by any means.

Electrical Notes.

An efficient type of electric battery designed especially for cars propelled by electric energy, is the Elieson-Bobinsky battery. In this type the cells contain five Planté plates, the negative and positive plates differing simply in thickness from other batteries. The distinctive feature of the plate is that the current enters through a central conducting lead tube from which thin laminæ extend to both sides, the outer ends being left free. By this arrangement there is no impediment to expansion, and consequently no buckling. Owing to the high degree of porosity and free circulation of the electrolyte, high capacities are obtainable—100 ampere-hours at a discharging rate of 20 amperes, 90 ampere-hours at 50 amperes discharge, and 73 ampere-hours at a discharge rate of 100 amperes. Another feature and advantage of this cell over the pasted plate type is the quickness of charging, since whereas the latter require several hours, the former can be charged in about three-quarters of an hour. The battery has been subjected to prolonged exacting tests by Messrs. Preece and Cardew, two well-known electrical scientists, and it was found that two-thirds of the full charge could be put in, within a quarter of an hour, while the battery withstood short-circuiting and reversing with commendable ease. From this it will be seen that this battery possesses several conspicuous features over the ordinary pasted plate cells, the most important being lightness in weight, high discharge rates, quick charging, and what is equally important, low cost of renewing the plates.

The phenomena of electric discharges in vacuum tubes give the nearest approach to seeing electricity that are likely to be made. The streams of corpuscles propelled along the tubes suggested to Crookes in 1870 the idea of a fourth state of matter, and these corpuscles—smaller than atoms and the same in all kinds of gases—were named electrons by Stoney, and have come to be regarded as the electric parts of all atoms, or even as making up matter itself. When torn from its groups or from matter, the electron travels with a speed comparable to that of light. A body charged with electricity, if at rest, presents the phenomena of electrostatics; if in motion, those of electricity and magnetism; if in acceleration or change of motion, those of light and radiation generally. Some substances—such as uranium, polonium and radium—throw off electrons without stimulus, giving intense and penetrating rays, with a kind of "electrical evaporation." This property of radio-activity is found in many bodies, even in leaves and newly fallen raindrops, and it will soon be difficult to find any substance without it in some degree. On the hypothesis that matter is composed of electrons, their size is known to be about the hundred-thousandth part of the diameter of the atom. In an atom of hydrogen there are about 1,000 electrons, in an atom of mercury there are 100,000; but even in the latter they are shown by calculation to be about as far apart in proportion to their size, comparatively, as the planets in the solar system. By their force the atoms come to be impenetrable. Of the fundamental properties of matter, inertia is considered to be electrical, cohesion is being shown to be so; gravitation is still a mystery.—Mining and Scientific Press.

There are few inventions in the electrical field which have benefited the chemist and metallurgist more than that comprised under the general title of "electric furnace." Up to, comparatively speaking, a few years ago, the highest attainable temperature by any known artificial means was 1,800 degrees Centigrade, or, possibly, with exceptional facilities and the exercise of great care, as high a temperature as 2,000 degrees Centigrade may, in some cases, have been attained, though the exact limit is questionable; certainly it does not rise much above the latter figure. Thanks, however, to the indefatigable researches of Moissan, Siemens, Borchers, Cowles, and some other investigators, we now possess a means for the artificial production of temperatures far above this limit, which enable us to fuse and otherwise treat commercially such hitherto refractory substances as chromium, platinum, carbon, and it is even possible to fuse the once indestructible crystalline form of that element, the diamond. Generally speaking, electric furnaces may be divided under two main headings, namely, those in which the heating effect is produced by the electric arc established between two carbon or other electrodes connected with the source of current, commonly known as arc furnaces; and those in which the heating effect is produced by the passage of the current through a resistance, which either forms part and parcel of the furnace proper, or is constituted, by a suitable conducting train, of the material to be treated in the furnace. The principle of this latter type is analogous to that involved in the heating to incandescence of the ordinary electric lamp filament, and such furnaces are, as a class, designated by the term resistance furnaces. The experience of late years in the construction and use of electric furnaces tends toward the establishment of the resistance furnace as a type more readily capable of efficient regulation.—J. Wright, in Cassier's Magazine.

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THE SECRET CANNIBAL SOCIETY OF THE KWAKIUTL.

BY WALTER L. BEASLEY.

Among the many Indian tribes of the northwest coast, probably the most interesting in regard to their mysterious and spectacular ceremonials is the Kwakiutl of North Vancouver Island. Their mythology is based upon the adventures of a number of their mythical and supernatural ancestors, who either dropped down from the sky, arose from the underworld, or emerged from the ocean. All the people are therefore supposed to be the descendants of these fabulous personages. This has afforded a wide range for their superstitious imagination to weave innumerable tales and legends and to construct enormous grotesque masks. The wearing of these carved representations of their ancestral spirits, who are still supposed to be present, will bestow supernatural help and power upon the person or clan who has acquired the right to use them. The magical gifts, dances, and crests of these spirits are all hereditary, but can also be obtained by marriage and initiation into one of its secret societies. The Kwakiutls have a number of these organizations, the most important and highly prized of which is the Ha-matsa. The startling and surprising feature of the Ha-matsa fraternity, aside from the weird and severe initiation, is the employment of a cannibalistic rite, which is rigidly enforced and enacted by the candidate. This flesh-eating habit, while known to a limited number of ethnologists who have witnessed and technically reported on the same, to the general public, however, has possibly never been pictured nor described. The writer lately had the exceptional opportunity of having several interviews with the most enlightened and influential member of the Kwakiutls while on a visit to New York. This gentleman is the leading authority on the customs and mythology of his people, having collected and furnished the National Museum at Washington and other institutions here and abroad with specimens and ethnological material relating to his tribe. The following account of the initiation ceremony of the cannibal Ha-matsa society is based largely upon his narrative, though it has lost some of its old-time ferocious qualities, when the Ha-matsa candidate is said to have devoured a body, yet in its present modified form it is undoubtedly one of the most remarkable Indian ceremonials of to-day. The origin for the Ha-matsa is based on an old myth or tradition which is considered one of the most sacred of the tribe. An ancestor, the protector and founder of the cannibal society, came down from the sky and was possessed of magic power which he could throw into objects, making them alive, and into men, either killing or transforming them. The source of this supernatural power lay in a small animal, said to be a frog that lived in his stomach, which caused unusual hunger. When his appetite had to be satisfied, a ceremonial piece was given, at which he wore ornaments of red cedar bark, which are at present the emblems of the society. He had four sons. Supernatural powers manifested themselves in one in his acting at times as a cannibal, and he also wore ornaments of red cedar bark. He was made invulnerable by being rubbed with the blood of the double-headed serpent, and thereafter became a great warrior and by conquering many chiefs acquired much property. Thus, to be victorious warriors, and to secure the above supernatural qualities of their great ancestor, the Kwakiutl instituted the Ha-matsa. In the initiation dances the candidate personates the protector by wearing his mask and ornaments, showing thereby to the assembled people that by a visit to the abode of the Spirit he has obtained his powers. The ceremony of initiation only takes place during the winter months. Before the candidate is admitted to the Ha-matsa he must have been a member for seven years of some of the lower orders. The preliminary meeting is called by the chief, who announces to the people that a certain young man is to be initiated. Shortly the candidate disappears and soon afterward his cry is heard in the forest. Then the head man of the society proclaims to the tribe that the Cannibal Spirit has taken the young man to his abode in the woods, to prepare him for initiation. He remains from three to four months in the forest. During this period he is isolated from the outside world, and is supposed to be living in touch with the supernatural Cannibal Spirit. When the time approaches for the return of the novice the various details for the initiation ceremony are arranged. Singing is one of the special features. Eight songs have to be arranged; these are looked after by the musical master, who takes a band of selected singers into the woods to compose and rehearse these new songs and tunes. A certain clearing in the thicket is always selected for this purpose. Here the songs are practiced which are to be used in the forthcoming performance. The Ha-matsa novice, however, listens unseen to the tunes, as he must dance to them correctly when he makes his first appearance. Any mistakes he should make are considered ill-omened and will bring disaster upon the people. When the time for the return of the absent novice draws near, the old members of the Ha-matsa and the rest of the various secret society men who are to take part in the initiation ceremony assemble at a special dancing house set apart for the purpose, usually ornamented in front by a totemic column, capped by the curved beak of the Raven, who is a messenger of the Cannibal Spirit. Here, by loud singing and other demonstrative effects, it is intended to attract the attention of the absent aspirant and induce him to return, when, by specially composed songs and dances, it is hoped that his wild and half-frenzied nature will be subdued. The waiting assembly is made up of the highest rank of the various secret orders, a master of ceremonies, a musical leader and several rows of singers. The Bear fraternity, who are dressed in the skins of grizzly bears, do a sort of detective duty, observing and punishing any mistakes made during the performance. The person making the error is scratched with their claws, which afford painful injuries. The singers beat their rhythm on pieces of pine boards, in a seated position. The square inclosure of earth is reserved for the dancing space, in the center of which a fire is kept burning. The faces of the old members are painted black and they wear rings of red cedar bark around the neck. Eagle-down feathers are worn in the head-dress. Then commences a loud musical and song recital, designed to charm back the novice. Messengers are sent out to report if he has been seen. Suddenly his steps are heard on the roof, which he has ascended by means of a pole arranged for the purpose. He jumps down and lands in a secret room in the rear set apart for him. This inclosure is dedicated to and supposed to be the abiding place of the cannibal deity of the Ha-matsa. The front curtain is ornamented with a design, which is intended to represent the great deity himself. By special arrangement, when the Ha-matsa candidate appears he is made to come out of the opening in the mouth of the drawing. He rushes out into the room in a frenzied state, wearing a head-dress of red cedar bark, with hemlock

Mask of the Double-Headed Serpent.

The Cannibal Ha-Matsa Novice.

Dancing-House of the Ha-Matsa.

Master of Ceremonies of the Ha-Matsa Society.

THE SECRET CANNIBAL SOCIETY OF THE KWAKIUTL.

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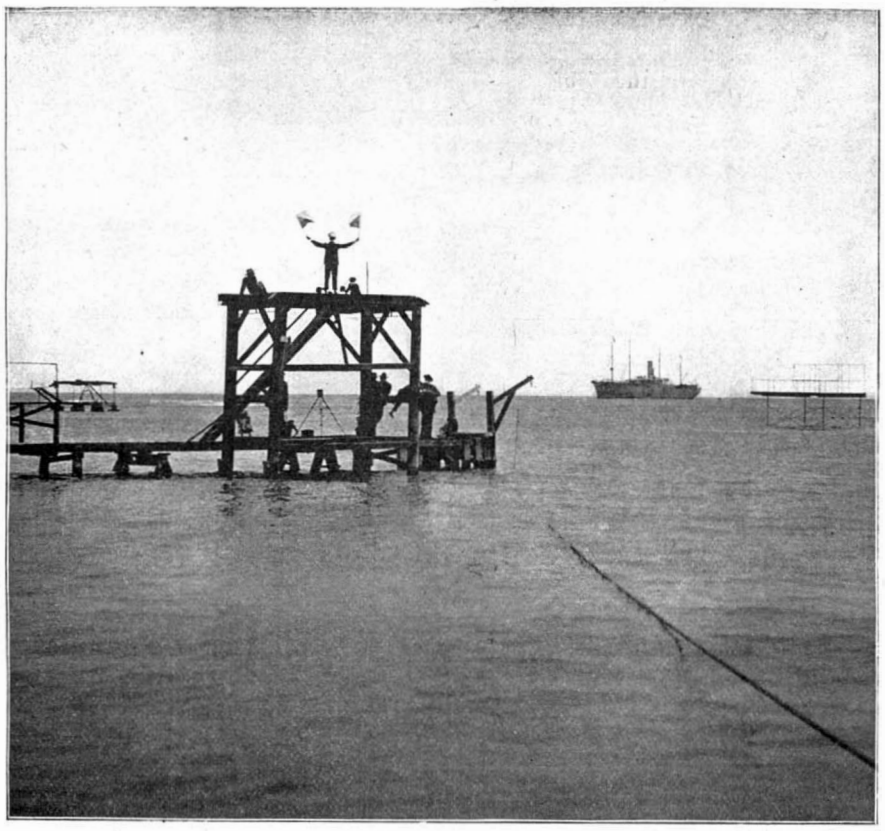
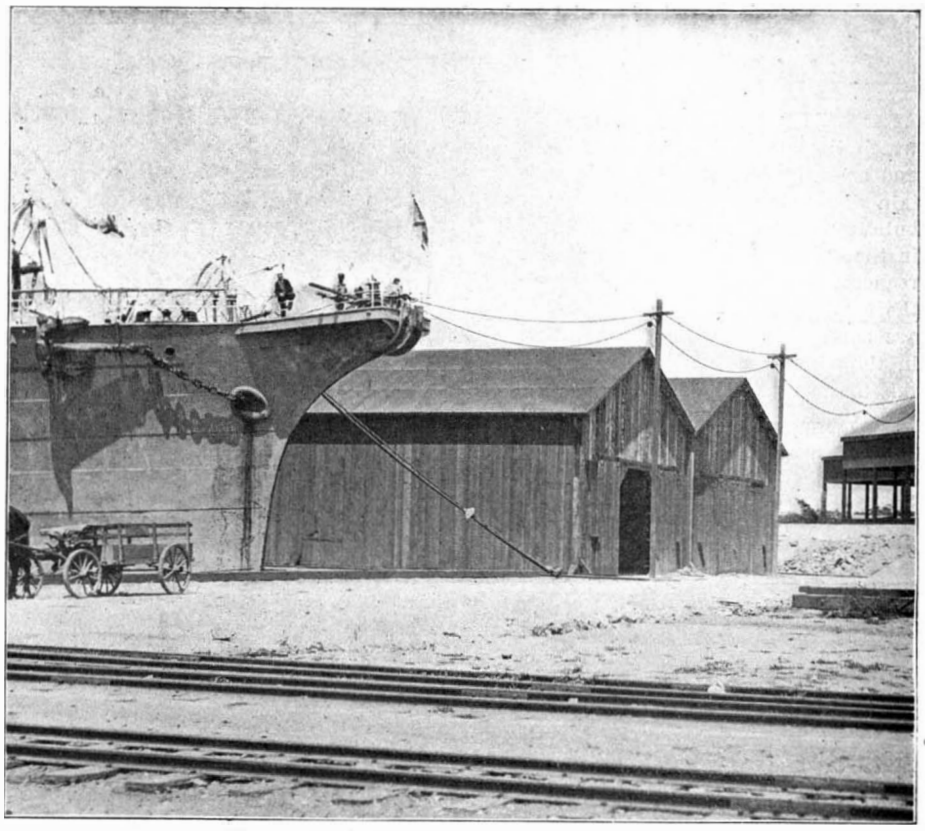
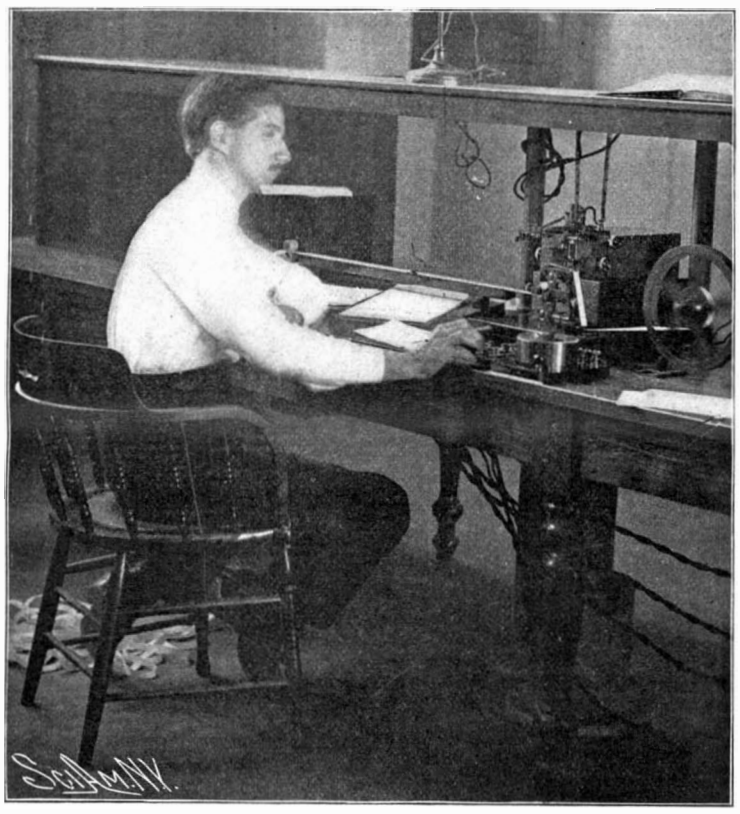


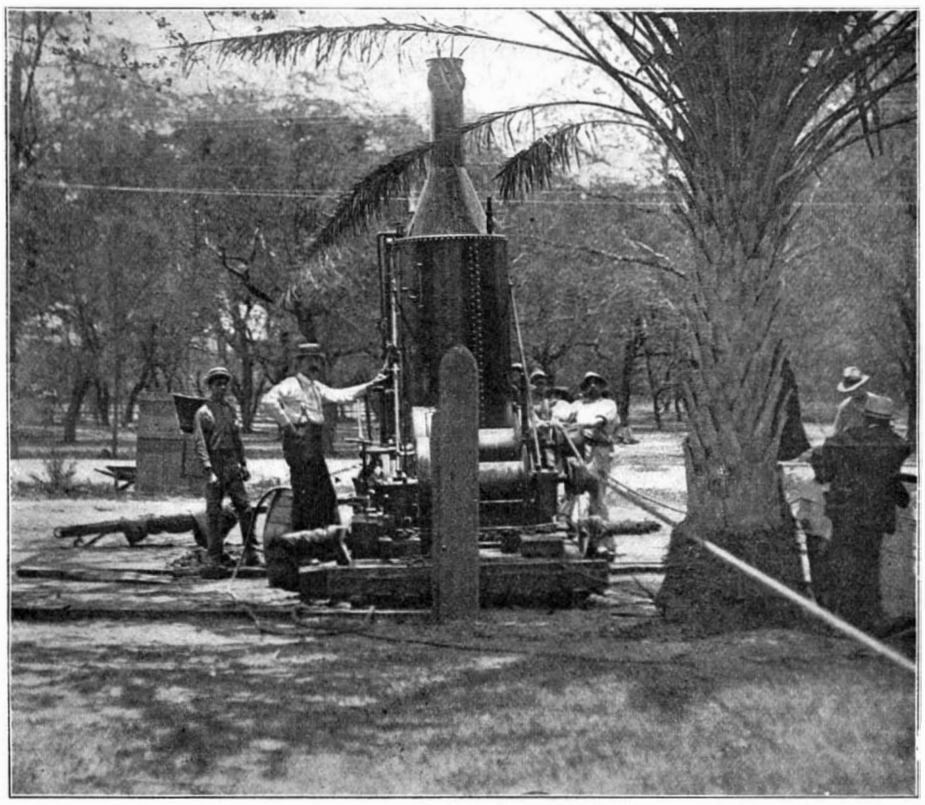
Wigwagging the Message from Shore to Ship.



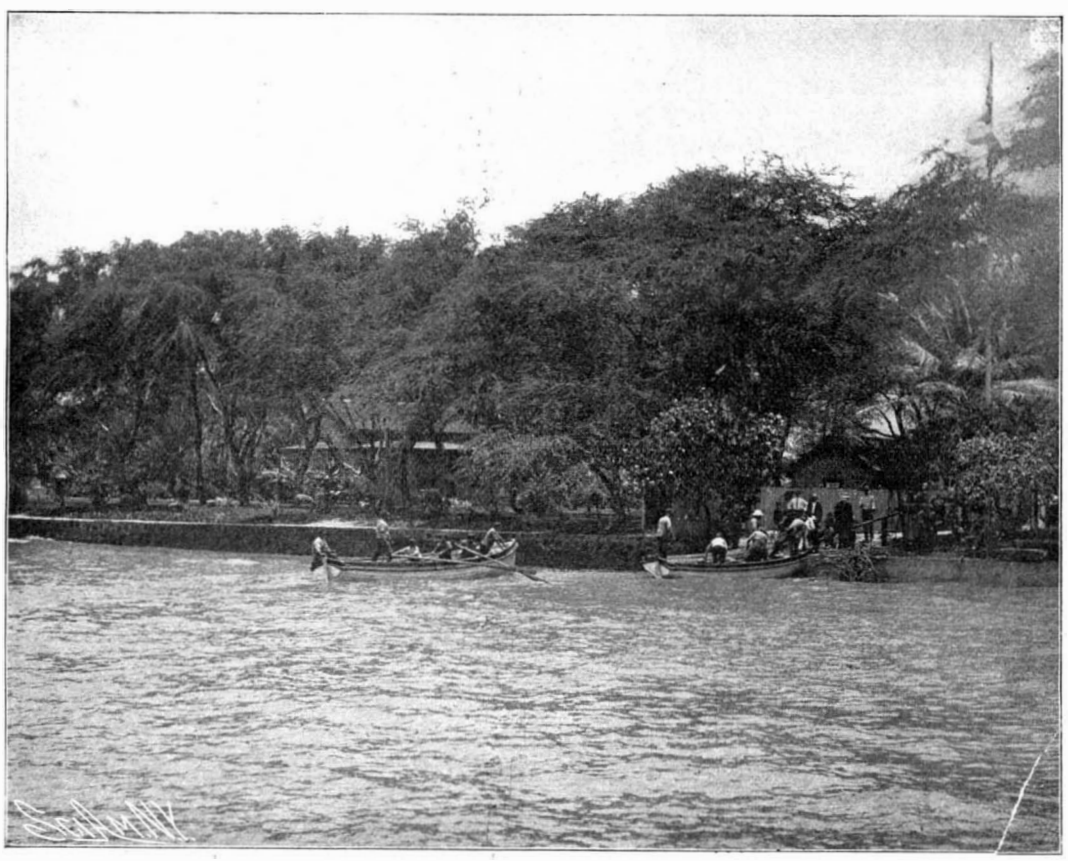
The Cable Ship Landing a Section of the Cable.



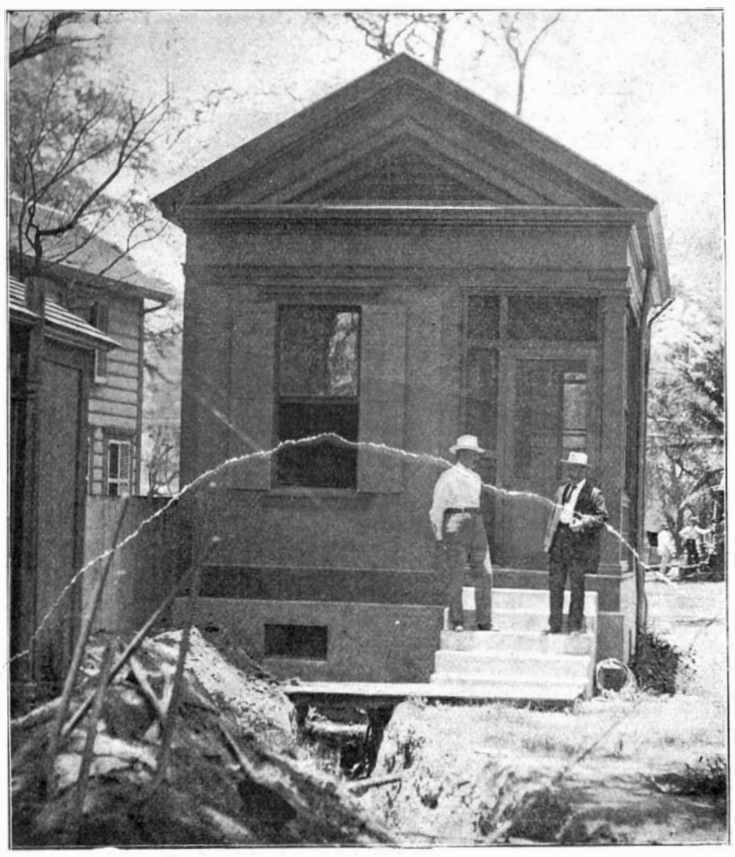
Operator Repeating the First Message from President Roosevelt to Governor Taft of Manila.



The Donkey Engine by which the Cable was Hauled Ashore.



Boats Landing the Light Line, by which the Heavy Hawser to which the Cable is Attached is Hauled In.



The Cable-Hut on Sans Souci Beach.

LANDING THE MANILA SECTION OF THE PACIFIC CABLE.—[See next page.]

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branches wound around his waist and ankles. Immediately upon his entrance he is seized by the large neck ring of cedar bark by several attendants, who try to hold him to prevent him from biting people. After wildly encircling the fire four times, during which time there is kept up a pandemonium of song and cries, he quickly makes his exit through the curtain of his secret apartment and disappears from the building. Not long after this his whistles are heard in the distant woods. The master of ceremonies then requests the assemblage to go out and try to recapture the fugitive novice. Outside the new songs composed are sung by all the people as they walk to and fro in the village and up and down the beach. During this interval the candidate has appeared several times at various nearby points. One of the assembly, half-clad, is then sent ahead to act as a decoy or bait for the novice. As soon as the Ha-matsa sees him he rushes up and bites mouthfuls of flesh from his arm. He is then surrounded by the assembly and marched toward the dancing-house, the people singing on their way. At this point a female dancer appears and begins to sing her new Ha-matsa songs, during which she moves toward the dancing-house, stepping backward and facing the novice, whom she desires to coax inside. Her hands and arms are extended as though she was carrying a body for the candidate to eat. The palms of both hands are turned upward in front of him and he keeps watching the hands of the dancer. All the assembly enter the house. After lingering an hour or so the novice goes to the rear and climbs up the pole to the roof, and descends down into the secret room. Shortly afterward he dashes out among the people and seizes the nearest man and bites his arm. He circles round the fire holding on to his victim by the teeth. This performance is repeated four times, the novice selecting a different man on each occasion. He is still thought to be out of his senses. In the first dance of the candidate he represents one looking for human flesh. His movements are executed in a squatting position, making wild and violent gestures as he proceeds. He wears a crown of red cedar bark, and is held by a large ring around his neck, so that he will not attack and bite more of the people. The female dancer again appears in front of him, dancing as before described. The candidate then returns to his secret quarters, and the people take off their cedar ornaments and throw them into the fire. This is called smoking the wildness out of the new Ha-matsa. For two nights thereafter the dances are kept up, after which the novice shows signs that he has become nearly pacified. The last night of the ceremony ends in a general festival, at which all the men, women and children of the tribe are invited. The candidate now appears dressed for the first time in a button blanket and a new headdress and neck-ring. He then pays the men for the bites he has inflicted during initiation, the price being a canoe for each bite. The women dancers are given bracelets, and the men who sang button blankets. The cannibal pole and curtain of the secret room are pulled down and burnt in the fire. The new-fledged Ha-matsa is henceforth considered a person of rank and power in the tribe, having acquired the magic gifts of his fabulous ancestor. The above is intended as a summary presenting some of the main features, and not a detailed account of the ceremony. The model of the Ha-matsa candidate and the masks here shown are now at the American Museum of Natural History, New York, which has the largest and most varied collection of Kwakiutl ceremonials in existence. Probably the most important is the immense mask, nearly six feet in width, of the double-headed serpent used in the Ha-matsa and other winter dances. It is the crest of one of their clans and has a horned head at each end, with a human face in the center. During the dance, by means of a cord which is pulled at the will of the wearer, the horns are erected, and the tongues of the snake are made to come out.

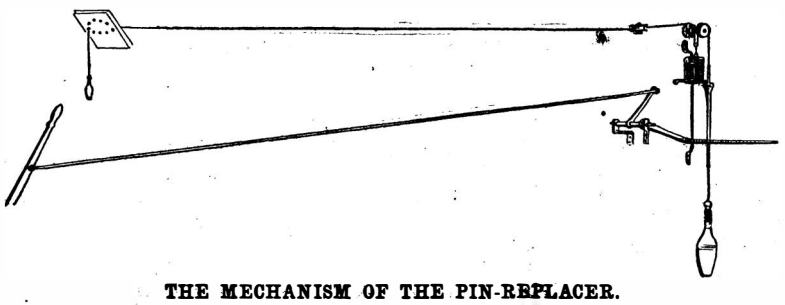
A system of deep well boring is practised in Japan, in the province of Kadzusa, which for cheapness and simplicity appears to be unequaled. An ordinary irrigation well leading down to the 30-foot water-bearing stratum in the province of Kadzusa costs only some $15, and $50 seems to be the highest price charged for going down to the 720-foot stratum. The secret of this system is the use of the bamboo.

AN AUTOMATIC DEVICE FOR REPLACING BOWLING ALLEY PINS.

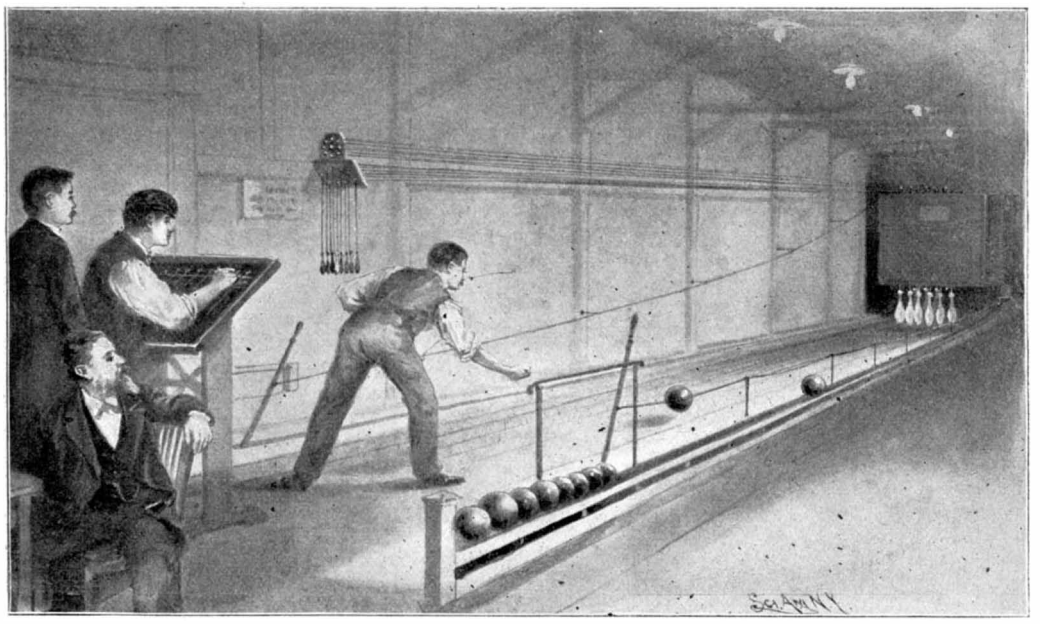
In Tempelhof, a Berlin suburb, an automatic bowling alley has been in operation which has aroused the greatest interest among bowlers.

At the end of the alley a box is erected through the bottom of which the pins are suspended, so that their bottom edges hang about 1¼ inches over the board floor of the alley. The pins are suspended in the box in such a manner that they can oscillate freely. As soon as the angle resulting, on oscillation, with the perpendicular exceeds a certain degree, a catch which holds the edge of a heavy counterweight is released. The object slides down on an iron bar and the pin is jerked upward into the box. It is curious to observe when a "strike" is made how all the pins disappear simultaneously.

From the pin box, wires run on the left side of the alley to a point near the bowler's end. Here a lever is mounted (in the illustration at the left of the bowler). When the lever is pulled back, the counterweights in the box at the end of the alley are lifted by the wires, the pins slide down and are held fast by the catch which falls into position again. Alongside of the board where the balls are delivered (in the illustration above the left arm of the bowler), are nine little pins suspended on wires from a board, the center pin or "king" being white to distinguish it from the others. These miniature pins are connected by wires with the apparatus in the box. When a real pin is jerked up through the action of the counterweight in the box, the miniature pin also flies up, so that the scorekeeper at the blackboard is enabled to see distinctly how many and what particular pins have been raised at the end of the alley.



THE MECHANISM OF THE PIN-REPLACER.



A MECHANICAL PIN-REPLACER FOR BOWLING ALLEYS.

The device for returning the balls is very simple. A ball of medium force, which has traversed the pin, drops into a groove which is inclined to the right. Through this groove the ball enters a small shaft. At the bottom of the latter is an iron tongue which is raised up by a pull on the lever (shown at the right-hand side in the picture), throwing the ball out and into the sloping return chute in which it rolls back to the players. Balls that have been delivered with great force run up an incline after going through the pins, drop into a groove and are conveyed to the right direct into the sloping chute in which they return to the bowlers.

This automatic bowling alley presents the following advantages: No pin boys are required and the possibility of carelessness on their part is done away with. After each throw all the pins can be brought into their correct position ready for the next throw, by a single pull at the lever.—Translated for the Scientific American from the Illustrirte Zeitung.

"Gassing" trees has become so large a business in California that a Los Angeles man has an outfit for it which cost $10,000. Tents are used to confine the gas to the trees and to protect the operators from the deadly prussic acid which is liberated from a saucer at the tree's root.

THE SENDING OF THE PRESIDENT'S MESSAGE AROUND THE WORLD.

On July 4, the dream of the late John W. Mackay of girdling the earth with his cable and telegraph system was realized; for on that day the laying of the Manila section of the Pacific cable was completed. About ten o'clock in the evening, the last connection in the new cable was made at Honolulu, and a test message was flashed around the world in nine and a half minutes. At ten minutes before eleven o'clock P. M., President Roosevelt sent a message from Oyster Bay to Governor Taft at Manila. The message read as follows:

Oyster Bay, July 4.

Gov. Taft, Manila: I open the American Pacific cable with greeting to you and the people of the Philippines. Theodore Roosevelt.

At nineteen minutes past eleven o'clock a reply was received from Governor Taft, which read as follows:

Manila, July 4.

President, Washington:

The Filipino people and the Americans resident in these islands are glad to present their respectful greetings and congratulations to the President of the United States, conveyed over the cable with which American enterprise has girded the Pacific, thereby rendering greatly easier and more frequent communication between the two countries. It will certainly lead to a closer union and a better mutual understanding of each other's aims and sympathies and of their common interest in the prosperity of the Philippines and the education and development of the Filipinos.

It is not inappropriate to incorporate in this, the first message across the Pacific, from the Philippines to America, an earnest plea for the reduction of the tariff on Filipino products in accordance with the broad and liberal spirit which the American people desire to manifest toward the Filipinos and of which you have been an earnest exponent. Taft.

The President then sent a message around the world westward to Clarence H. Mackay, who was with Mr. Roosevelt at Oyster Bay. The message was given to the operator at 11:23 P. M. It was received by Mr. Mackay twelve minutes after its journey around the world.

The course of President Roosevelt's message around the world was by the Postal Telegraph Company's land wire from Oyster Bay to San Francisco, thence by the Commercial Pacific cables to Honolulu, to Midway, to Guam, and to Manila. From Manila to Hongkong the message passed by the cable which was lifted and cut by Admiral Dewey on April 25, 1898, to cut off the Spaniards' means of communication with Spain. From Hongkong it went to Saigon, to Singapore, to Penang, to Madras, to Bombay, to Aden, to Suez, to Alexandria, to Malta, to Gibraltar, to Lisbon, and to the Azores. Between Hongkong and the Azores it had passed by foreign cables. At the Azores it was taken up again by the Commercial cables and sent to Canso, to New York, and to Oyster Bay.

The message around the world was sent through the following sections of historical electrical circuits, these sections having been welded into one circuit and interpolated in the circuit of the Postal Telegraph Company, over which the message was sent:

1. Section of the wire over which Prof. Samuel F. B. Morse sent the first message by means of the Morse telegraph.

2. Section of the wire over which audible speech was for the first time transmitted by means of the Bell telephone by Prof. Alexander Graham Bell.

3. Section of the Atlantic cable through which the first cable message was sent across the ocean by Cyrus W. Field.

4. Edison plug and section of wire through which was lighted the first incandescent lamp ever lit from an electrical lighting central station.

5. Section of the first trolley circuit put up at the historic Richmond, Va., Electric Railroad by F. J. Sprague.

6. Section of the wire through which the current of electricity was sent by President Cleveland when he opened the World's Fair at Chicago.

7. Section of the wire through which the electricity was sent to illuminate the headquarters of the American Institute of Electrical Engineers by Moore's system of vacuum tube lighting, this being the first room in the world so lighted.

8. Section of the cable through which the first cur-

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rent of electricity was transmitted from Niagara Falls electric power plant, April 16, 1895.

Many messages of congratulation from governors of the several States and mayors of the various cities were sent over the new cable.

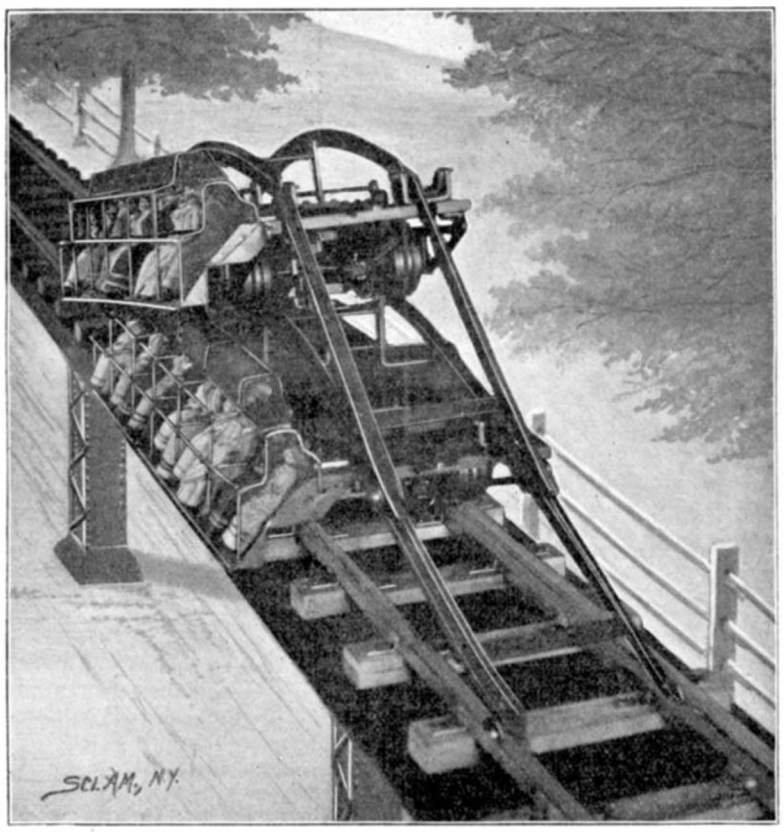
A severe storm at Honolulu prevented the landing and splicing of the cable on the morning of July 4, thus delaying the sending of the message all day. After landing the end of the cable connecting Midway Island, Guam, and Manila, the cable steamer "Anglia" began paying out cable from the shore for connection with the end of the deep-sea strand buoy seventeen miles off shore. At this point the two strands were spliced.

A NOVEL AMUSEMENT APPARATUS.

From time to time we have described in these columns various forms of apparatus which are used at seaside resorts for the attraction of the multitudes that congregate there in the hot summer months, and which display a degree of mechanical ingenuity and understanding of physical laws that in some cases might well have been applied to better advantage in other directions. To the "loop-the-loops," "scenic railways," "shoot-the-chutes" and other contrivances with equally vivid and enticing names must now be added an apparatus fully as ingenious as these and fully as competent to tickle the sluggish sensations of the *blasé* New Yorker. This apparatus is intended to furnish the delightfully horrible experience of a head-on collision, without, however, killing or maiming the passengers who are seated in the railway cars employed. The railway system by means of which this end is attained is the invention of Mr. P. K. Stern, a New York electrical engineer. His system is remarkable chiefly for the daring conception which it expresses and for the exceptional skill shown in devising mechanism absolutely safe in its operation. In Mr. Stern's railway system a single track is used, on which railway cars are caused to travel, either in the same or opposite directions. When one car meets another, it simply rides over the roof of the opposing car on specially provided rails, gently rolls down on the other side upon the track, and proceeds upon its way as if it had never left the roadbed. The photographs herewith reproduced were taken from an electrically-driven working model, made strictly according to scale.

The cars, although they run upon wheels, are really traveling bridges with overhanging compartments for the accommodation of passengers. Over the framed structure of the cars thus constituted, an arched track is carried, securely fastened to the car and serving the purpose of providing a roadbed for the colliding car. This superimposed track is built in accordance with well-understood principles of bridge construction. The outer ends of each superimposed track are designed to form with the surface of the roadway an overhead switch provided with specially formed pilots and with a horizontal axis and a vertical axis. Upon each horizontal axis the respective outer portions of the arched track can swing vertically, and upon the vertical axis the track can swing to a limited extent from side to side. The pilots of the superimposed track are automatic in their operation. When they strike the car ahead they immediately travel up the inclined superimposed way of that car, thereby guiding the car to which they are themselves attached. After the superimposed car has passed over the car below it, the rear pilot as it descends, will be lifted and will gradually drop by gravity to the roadbed.

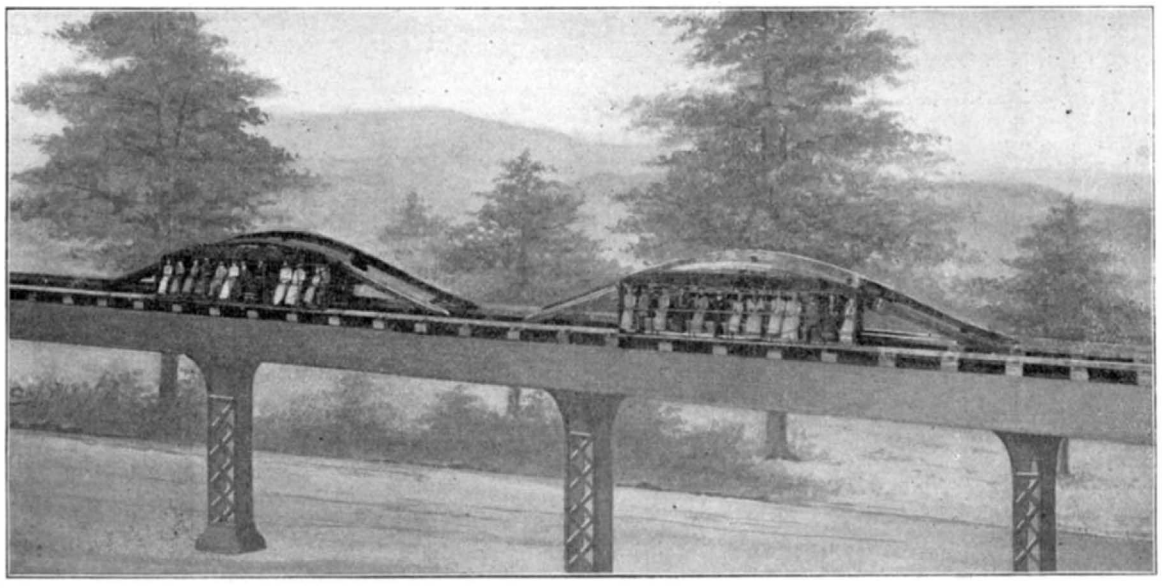
In the limited space at our disposal, it is impossible to give more than a general idea of the construction and operation of this remarkable railway system. A few features should, however, be specifically mentioned. The permanent roadbed upon which the cars normally travel and the superimposed track on each car are of different gages. The wheels of the car resemble those which were once used on old-fashioned cable railways, formed as they are with a broad middle flange traveling in a centrally grooved track, with lateral portions of smaller diameter sustained by flanges which flank the central groove of the track.



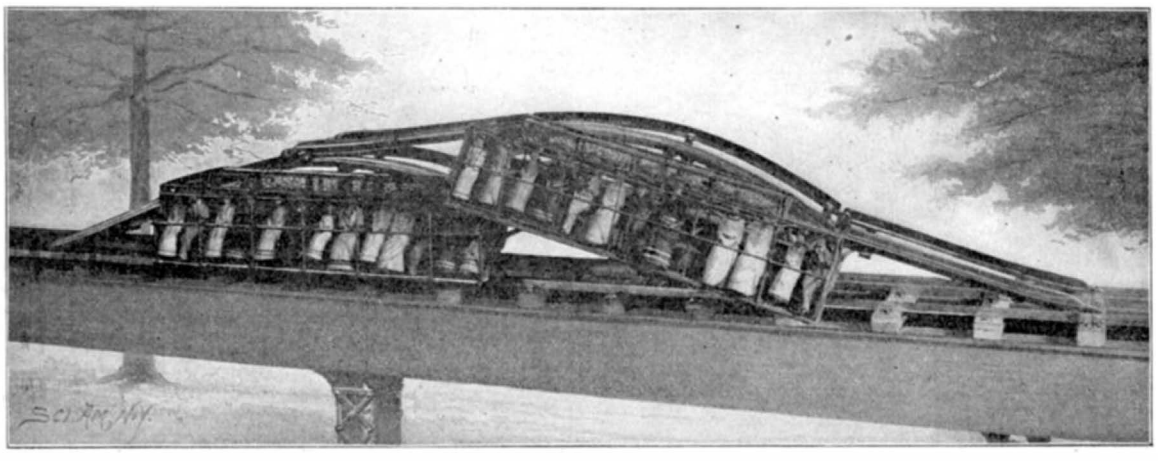
AFTER THE COLLISION. THE ONE CAR RIDING OVER THE OTHER.

As our illustrations show, the forward ends of the pilots of the superimposed tracks are provided with rollers and skids which are so designed that one car shall mount the other without shock. The skids gently ride up the inclined track of the car ahead and sufficiently elevate the rollers of the pilots to permit them to run upon the superimposed narrow gage track without jar. The car itself follows with a motion equally as gentle. In actual practice cars of 11 feet 6 inches in length will be employed, the extreme length being 43 feet.

The passengers will find accommodations in the car bodies arranged along each side of the traveling structure, and provided with a removable roof and sides in order to permit ready means of ingress and egress. The top of the rail is only 6 feet above the base rail. In actual practice the cars will be run at a speed about 10 to 15 miles an hour and will be caused to collide at about 8 miles an hour, which will be quite sufficient for amusement purposes. The inclined tracks with which each car is provided form a gradient of 25 per cent. The actual power to mount such a grade is probably less than that required to send many a railway train around a sharp curve. The peculiar, arched structure which surmounts each car, when considered in connection with the permanent track itself, forms an undulatory roadway upon which the cars travel with a motion very much akin to that of a boat riding on a billowy sea. The motorman is to take his seat on the roof of each car at about the middle, at which point he will have a clear view of the track ahead and behind him. When in operation a central slot will be used through which a plow works, which will take up the current for transmission to the motor. The rails will be used as a return.



THE CARS JUST BEFORE IMPACT.



THE OVERRIDING CAR ON THE DESCENT.

Edison on X-Rays.

New York newspapers have been publishing some statements said to have been made by Edison on the physiological effects of X-rays. Mr. Edison states, according to these accounts, that such is the destruction wrought by the rays that one of his laboratory assistants, Charles Daily, was so seriously injured that it was necessary to amputate his left arm and the fingers of his right hand. The physiological effect noted is the direct result of the killing or paralyzing of the white corpuscles of the blood. Mr. Edison himself has suffered not a little from stomach trouble as the result of experiments with X-rays.

Mr. Edison's observations are confirmed by the experiences of two physicians in the radiograph department of the London Hospital. These physicians have fallen victims to the X-rays and have sustained very severe injuries. Gloves with lead foil sewn into the back have been employed in London, but have been found to impede the hand to such an extent in surgical work that it was necessary to abandon them. Dr. Wilson, one of the two men who used to make direct examinations with the rays at the hospital, explained that he had not carried out any X-ray work for a year and a half; yet his hands showed little signs of healing. Indeed, he seriously doubted whether his finger-nails would ever grow properly again. The first symptom of X-ray injury is a troublesome inflammation of the hands, and insomnia, accompanied by swellings resembling chilblains. The nails are affected to such an extent that a festering ridge is formed down the center. After treatment, the nail seems partially to perish. Apparently the injury to the matrix impairs future growth.

The eyes, too, are apt to suffer from the rays. Pathologically considered, the results of the X-rays seem to be cumulative. Up to a certain point they are highly beneficial; beyond that, just as highly injurious.

At Guy's Hospital announcements have been made which directly refute the experiences of the London Hospital men and those of Mr. Edison. It is stated that the wonderful cures at Guy's made by the X-rays in the treatment of rodent ulcers are attributed by several of the authorities to the enriching action of the rays on the blood by the increase of phagocytes. The hospital doctors seem to think that Mr. Edison has confused X-rays with ultra-violet rays. About 1,200 persons are treated annually by X-rays at Guy's and no case has been reported where injuries resulted from the treatment.

A ball of india rubber immersed in liquid air becomes brittle, and if dropped to the floor breaks like glass. A lead ball acquires elasticity and will rebound like the rubber in its normal state.

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RECENTLY PATENTED INVENTIONS.

Electrical Devices.

ELECTRIC TARGET.—W. F. MANGELS, New York, N. Y. The inventor's object is to provide a new and improved target which is simple and durable in construction and arranged to sound an electric alarm whenever the bull's eye is struck by a projectile, the alarm being automatically sounded a length of time governed by the impelling force exerted by the projectile on the bull's eye.

Engineering Improvements.

STEAM-ENGINE.—M. CASTELNAU, 8 Rue Richepanse, Paris, France. The invention of Mr. Castelnau relates to improvements in high-tension and high-temperature steam engines; and the object is to provide a steam engine so arranged as to avoid the objections arising from the excessive temperature of steam and to allow in practice the use of steam at a pressure of over forty kilogrammes. To obtain this result, the machine is so arranged as to do away with the stuffing boxes of piston rods and to cool the cylinder internal wall by the direct contact of the exterior air.

MUFFLER.—T. H. JAMISON, Claysville, Pa. The object aimed at by this inventor is the provision of a new and improved muffler which is simple and durable in construction and arranged to effectively muffle or deaden the exhaust of steam engines, explosive engines, or other engines and machines without causing any back pressure in the engine cylinder.

Household Utilities.

BABY-WALKER.—J. L. PHILLIPS, Washington, D. C. This invention relates to certain improvements in the construction and manner of suspending baby-walkers—that is to say, devices used for encouraging children to walk. The child is free to move around in various directions, but it is at all times supported, and is allowed to press only a small portion of its weight upon its legs.

IRONING-BOARD.—J. A. PIERCE, Miami, Ind. Ter. This ironing board belongs to that type in which is included a tension device for bearing the iron on the article being pressed and a vertically adjustable stand adapted to support interchangeable presser boards, and the invention primarily seeks to provide a board in which the several parts are arranged to be conveniently manipulated and set to the different adjustments.

BROOM-ATTACHMENT.—I. P. KILGORE, Westpoint, Ill. Mr. Kilgore's invention is an improvement in broom attachments, being in the nature of an oiler for brooms whereby oil may be supplied to the brooms in any desired amount for the purpose of oiling floors, etc. The invention is applicable to the ordinary brooms on the market and may be applied thereto by the purchasers of the can.

HANDLE FOR TOILET ARTICLES.—L. B. PRAHAR, New York, N. Y. The purpose of the invention is to furnish means for connecting mirrors and the like to their handles without detracting from the strength of the handle and so that the handle may be quickly applied and removed, the act of applying the handle causing the band for the mirror or other article to be drawn tightly around the same and to bear at its inner central portion against a ferrule, which ferrule in its turn is pressed toward the article clamped by the handle, with which it engages when the latter is tightened.

Machines and Mechanical Devices.

MACHINE FOR PLACING MATERIAL IN BRUSH-BACKS.—C. W. SMITH, New York, N. Y. This machine has devices for grasping bristles or brush and separating them from the stock in bulk in tufts to fill the hole in the block to a proper extent. These devices then carry the brush material to a point where a clip is applied, and the material is then bent to form a double thickness. Finally the clip is held so that the brush-back may be taken in the operator's hands and forced on the brush material, holding devices then acting to fasten parts of the clip into the brush-back, whereby the material is held in place. The operation is automatic except as above mentioned.

HAT-SEWING MACHINE.—E. G. O'DONNELL, Fall River, Mass. The present machine is of the same general character as that shown in a previous invention of Mr. O'Donnell. By means of a certain arrangement the sweat-band is fed with absolute uniformity with respect to the hat, and stretching or yielding of the cloth backing of the sweat-band is not permitted to interfere with the accuracy with which the sweat-band is placed in the hat.

Pertaining to Vehicles.

PAWL-AND-RATCHET DEVICE.—H. W. COOLEY, Lonerock, Ore. In this patent the invention relates to pawl-and-ratchet devices for holding or locking mechanical contrivances, such as the brakes of vehicles, although it may be used in other relations. The improvement provides a means for locking a part, such as a brake-shoe, in an applied position and for releasing the locking device by a pull exerted in the same direction as the pull required to apply or set the part.

Railways and Their Accessories.

CAR-COUPLING.—S. K. DUNKLE, Sharon, Pa. No link is used in this class of car-couplings, and the object of the improvement is to provide a linkless coupling which embodies the elements of simplicity, economy, durability, and safety. The coupling operation can be effected with absolute safety, as no one is required to go between the cars.

RAIL-CLAMP.—C. W. HILL, Forest City, Ill. The object of the present invention is to provide a rail-clamp more especially designed for use on car-trucks carrying steam shovels, excavators, and the like, and arranged for automatically forming a stop or block for the car-truck wheels to prevent backward movement of the truck, but to allow free forward traveling thereof as the work progresses and the car-truck advances correspondingly. The invention relates to rail clamps, such as shown in a former patent of Mr. Hill.

DUMPING BOX-CAR.—G. E. SIMONTON, Vanwert, Ohio. The primary object of this invention is to produce a twin hopper dumping car with means for securely closing the filling or loading openings in the roof for the purpose of excluding rain and weather from grain or other bulky material. The roof doors are constructed to open freely in order to fully expose the openings, and they are arranged to fold snugly over the openings to effectually close them, special provision being made to thoroughly close the joint between the meeting edges of the doors for the more perfect exclusion of the weather.

Miscellaneous.

GOODS-EXHIBITOR.—S. STENGER and J. C. MALLORY, Altoona, Pa. The improved exhibitor of these inventors is for displaying merchandise—such as oil-cloth, linoleum, matting, carpets, and the like—in rolls or bolts. Provision is made for a series of rolls and a knife is provided that may be adjusted to any one of the rolls for cutting off the desired quantity.

TENSION DEVICE.—J. BARRETT, Tombstone, Ariz. This invention of Mr. Barrett comprises certain novel features of construction; and relates to a device for operating bell-cords and all other flexible connections to whistles, trip devices, and like instruments where a signal or impulse is to be transmitted.

LOCK FOR COLLAPSIBLE BOXES.—J. R. VAN WORMER, Atlanta, Ga. The present improvement of this inventor relates to a means for fastening together the parts of collapsible boxes formed of paper or other analogous material. The improvement is particularly adapted for use in connection with a "nestable paper box" previously patented by Mr. Van Wormer.

ENVELOPE MOISTENING AND SEALING DEVICE.—A. GOLDSTEIN and B. GOLDSTEIN, Patton, Pa. The purpose in this case is to provide a device adapted for moistening the gummed portion of the sealing-flap of an envelop and for effecting a closure of such moistened flap upon the body of the envelope, and, further, to provide a hollow cylindrical body or roller for such purpose adapted to contain liquid and one or more absorbent pads exposed at the exterior of the roller, which pads are held in communication with the liquid contents of the roller.

MUSICAL INSTRUMENT.—G. H. BLAIR, Spokane, Wash. In carrying out this improvement the inventor contemplates the provision of an instrument, especially a mandolin, which shall have an increased sweetness and power of tone. The object is to so construct the top of the instrument that the ordinary ridge shall be discontinued along the bass-section of the top, thereby permitting the vibrations to travel uninterrupted along the entire bass-section, which will give greater strength and volume to the tone.

TRUCK FOR STOOLS OR CHAIRS.—F. A. MAST, Davenport, Iowa. This invention has for its purpose to provide a four-wheeled truck of novel construction that may be attached upon the legs of a chair or a stool and afford means for the easy propulsion of the seat in either direction laterally in front of a long desk, thus enabling an accountant to quickly obtain access to any of a number of heavy books arranged in sequence on the desk, thus saving time and labor while conducting an examination and entry of accounts in a number of large books.

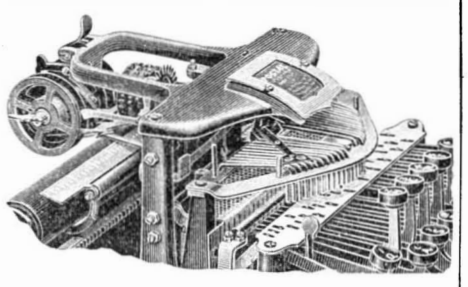
TRANSPARENT-SLIDE FOLDING BOX.—S. PRAGER, New York, N. Y. A main object of the present invention is to construct a box which may be provided with a transparent top of any suitable material—such as celluloid, gelatin, mica, or the like—the translucent material being retained securely in place on the top without the use of any fastening substance or means, such as cement, glue, or other adhesive material.

NON-REFILLABLE BOTTLE.—I. MORGENROTH, New York, N. Y. The object in view of this inventor is the provision of a construction which allows a bottle or package to be originally filled in an easy manner, after which the several parts may be quickly assembled to prevent access being obtained to them for subsequent removal and at the same time allow the liquid to be easily and readily decanted.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

AN EFFICIENT LOW-PRICED TYPEWRITER.

A demand for a good typewriting machine at a low price has existed for many years, yet no machine has succeeded in meeting the requirements until recently. This was done by the Postal Typewriter, as it combines high quality with low cost and it has been done, not alone by reducing the number of parts, but what is far more important, the number of accurate working points and accurate adjustments.



In the Postal the typewheel is stopped at the proper letter by an arm geared to the typewheel striking a pin lifted in the path of the arm by the key lever depressed by the operator. This arm, made for the sake of lightness and strength, of the finest tempered tool steel, carries a switch, also made of tempered steel. This switch is connected by the simplest kind of mechanism to the printing escapement and unlocks the escapement when the arm strikes the raised pin. Thus one adjustment of this switch and printing escapement does away with separate adjustments for each of the 28 key levers as in other wheel machines, and saves enormously in labor besides reducing the liability of wearing out of adjustment by 28 to 1. This stopping and unlocking device is one of the most original and practical things brought out in the typewriter art in many years. The printing is done by the typewheel striking down on the paper platen, just like a typebar does, and this gives a great manifolding power, something not considered possible in wheel machines.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 4458.—For a digester apparatus to reduce bones and other animal matter to a liquid or jelly.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4459.—For manufacturers of ordinary and elaborate wall-paper.

Morgan Emery Wheels. Box 517, Stroudsburg, Pa.

Inquiry No. 4460.—For makers of domestic rugs and carpets.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 4461.—For manufacturers of tiles for bathrooms and floors.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 4462.—For plows with 7 to 20 blades, to be driven by steam or electricity.

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4463.—For harvesting machines for corn.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4464.—For machines to grain maize and at the same time reduce the stem, core and leaves to forage.

We make anything in sheet metal, any shape. Estimates free. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 4465.—For manufacturers of poker or card machines.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4466.—Wanted, one-quarter horse power variable speed counter shaft for printing press.

Machine Work of every description. Jobbing and repairing. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 4467.—For makers of photo-engraving appliances complete.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4468.—For manufacturers of barrel-making machines.

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc. Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 4469.—For a machine for filling and folding powder papers at the same time.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 4470.—For manufacturers of machinery for making wax matches.

Contract manufacturers of hardware specialties, machinery, stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., Chicago.

Inquiry No. 4471.—For manufacturers of machinery for making cotton cloth.

Matthews Torpedo Launches. Matthews & Co., Bascom, Ohio, U. S. A. Builders of high grade power boats.

Inquiry No. 4472.—For makers of gas reservoirs, also construction companies to undertake laying gas mains.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4473.—For machinery for manufacturing bottle-wrapers.

WANTED.—A gas producer engineer or draftsman familiar with construction and operation of gas producer. State experience. Weber Gas and Gasoline Engine Co., Kansas City, Mo.

Inquiry No. 4474.—For manufacturers of broom making machinery.

WANTED.—Patent Office draughtsmen; only thoroughly experienced men need apply. Must show specimens of patent drawings. Munn & Co., SCIENTIFIC AMERICAN office, 361 Broadway, New York.

Inquiry No. 4475.—For manufacturers of spikes for railroads.

Representatives for Spain.—Hormaechea, Elorriaga & Co., Calle Libertad No. 1. Po. lo., Bilbao, Spain. Offer their services to represent American manufacturers of novelties and new patented inventions. Will handle agencies to entire satisfaction, guaranteeing best service. A 1 references furnished to parties interested.

Inquiry No. 4476.—For manufacturers of paper bottles and plates.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 4477.—For the manufacturers of the Remington mower.

Inquiry No. 4478.—For a machine for cleaning carpets, etc., without taking them up.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9153) V. L. B. says: Please answer the following questions in your columns of Notes and Queries: Has charcoal been reduced to the liquid state, and if so, is it of any scientic use in that form? A. We have no knowledge of charcoal being liquefied. The utility of such a process would depend on the chemical and physical properties of the product. We are inclined to think that use could be found for it. 2. Will ice melt in a vacuum, or simply vaporize? A. A substance cannot be melted if the pressure upon it is less than its vapor pressure at its melting point. The pressure of aqueous vapor at the freezing point of water is 4.6 mm. Hence in a vacuum of less than 4.6 mm. of mercury ice cannot be melted.

(9154) C. N. M. says: I wish to learn how much horse power a wheel will produce in a stream running 4 miles per hour, 4 feet deep, 24 feet wide. What is the best system for a wheel, etc.? A. A stream running 4 miles per hour, 4 feet deep, and 24 feet wide, would develop, if it were possible to utilize all of the energy in the water, 0.6 horse power. With a paddle-wheel covering the full cross-section of the stream, it would be impossible to utilize more than one-third of the above amount, or 0.2 horse power. The scheme, therefore, as you suggest it, seems hardly feasible. If, however, it were possible to obtain a fall of even a few feet, there is sufficient water here to give a valuable water power. With a fall of 10 feet, very nearly 10 horse power could be developed.

(9155) L. E. D. B. says: Being a subscriber of SCIENTIFIC AMERICAN would like very much to ask a few questions about operating a boiler. As it is with me, I have taken a position entirely out of my line. I am an apothecary or chemist by profession, but by ill-luck, as it were, was hired as such, but when I arrived in above-named city (Salt Lake City) I was placed in as engineer and fireman, which I know nothing about; but as it is at present, I would like to ask you which would be the best way to run or operate a boiler to get up steam in a hurry, of which I will endeavor to give a diagram explaining to you the style and pressure required; viz., No. 1 being the safety valve at 100 pounds pressure; No. 2 the three water valves; No. 3 the water gage; No. 4 the Penberthy water injector; No. 5 the sump box, the water of which gets very hot at times so that the injector will not raise (how can I remedy that?); No. 6 the fire box; Nos. 7, 8, 9, and 10 man or hand holes to boiler; No. 11 feed pipe to engine and steam heating plant; No. 12 blowout pipe in center rear of boiler. If you can give me full particulars to above either by mail or through your most esteemed and valuable paper, the SCIENTIFIC AMERICAN, would be very much obliged to you. A. We would say that it is impossible for us in the compass of a single letter to give you the in-

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structions needed to enable you to safely run a steam boiler. Much experience is necessary. We would refer you to "Steam Boilers: Their Care and Management," by S. Roper, price $2; "Steam Boilers: Their Management and Working on Land and Sea," by J. Peattie, price $2. You can get much help from these sources and we can supply the books. The most essential things for you to do are to always watch the water level and the pressure in the boiler. If the water level gets low, or the pressure unduly high, the safest thing to do is to immediately put ashes on your fire until the boiler has partially cooled down. Try the three water valves frequently, so as to be sure that they are in proper working order. Blow off the boiler frequently, to be sure that the water in the boiler does not get impure. An injector will not work unless the water in the injector well is kept cool. If it is impossible to keep this cool, a steam pump must be used in place of an injector.

(9156) E. H. S says: I have a 5 horse power gas engine, and want a small dynamo which will generate about 6 or 8 volts or use about 1 horse power, as I want to use it for experimental work, such as running electrical toys and the like, and principally for the experience I will get by building it. Please give me some plans for the making of the magnets and everything complete and oblige. A. We cannot advise you to make a dynamo which shall furnish a horse power and have but 6 or 8 volts. Its amperes would be inconveniently large, and it would be no better adapted for running toys than a machine of 1 horse power but of a much higher voltage. We have a machine of 1 horse power in our SUPPLEMENT, No. 600, whose current is of 50 volts. This will light eight lamps of that voltage, which would be enough for many purposes in the evening in a house, and besides would be available for all sorts of experiments. All that is needed is a rheostat of iron wire, which you can easily construct, and you can have one volt on a piece of small toy apparatus; or you can have the whole power of your machine if you wish. In case you wished a small machine for simply performing experiments you would do better to make the machine of our SUPPLEMENT, No. 161. It is called the hand power dynamo, but you can belt it to your gas engine and drive it without any difficulty. This furnishes 3 amperes at 12 volts and will do all the toy business you may wish. A short piece of iron wire will act as a rheostat to give you as small a voltage as you may desire. There are dynamos built for electro plating with 6 to 8 volts, and of 1 horse power.

NEW BOOKS, ETC.

OFFICIAL AUTOMOBILE BLUE BOOK. C. H. Gillette, editor. New York: The Automobile Blue Book Co. 1903. Price, $3.

To anyone who contemplates touring in an automobile, the 1903 Automobile Blue Book is almost a necessity. The second year of this useful publication finds it considerably enlarged and improved. Routes are given radiating from and connecting almost all the principal cities in the New England and the Mid-Atlantic States, besides New York State; and these routes are concisely described in both directions, so that whichever way the automobilist is going, he can easily follow the route. The Blue Book repair and charging stations and the best hotels are designated in every instance, thus making it easy for the traveler to plan his route where the best accommodations are to be had. Besides the many routes for touring described, much information of value to motorists will be found between the flexible leather covers of this useful book, such as laws governing the automobile on the highways of the various States, the automobile customs regulations of the different countries, etc. Supplements to the Blue Book are issued in July, October, and January, thus keeping it well up-to-date; and special maps dealing with the different sections can be had of the publishers at 50 cents each.

GEOLOGICAL SURVEY OF CANADA. Annual Report. Vol. XII., 1899. Ottawa. 1902. 8vo. Plates and maps.

The excellent work which the Canadian Geological Survey is doing is shown by the admirable report before us. It consists largely of a collection of monographs by specialists.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

August 4, 1903,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising device, S. S. Fels 735,486
Adz, single hand, O. Keehme 735,268
Air brake, automatic, Shannon & Mullen.. 735,603
Air brake system, W. B. Mann 735,544
Alternately actuating mechanism, G. W. Whittington 735,685
Anchor for guy ropes, E. E. Whitehead.... 735,187
Annealing furnace, S. Huxley 735,264
Annunciator, E. M. Hewlett 735,511
Axle, vehicle, G. B. McWilliams 735,568
Baby jumper, A. Heitmann 735,668
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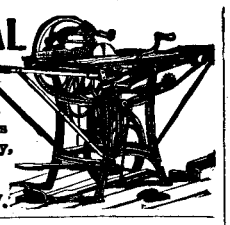

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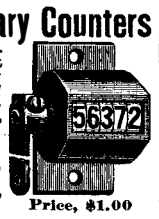

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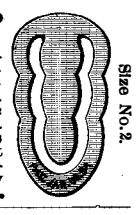

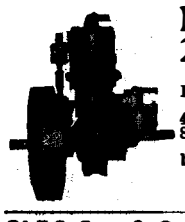

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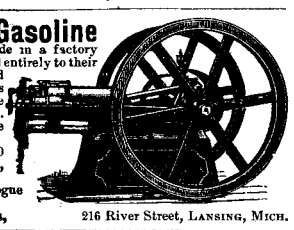

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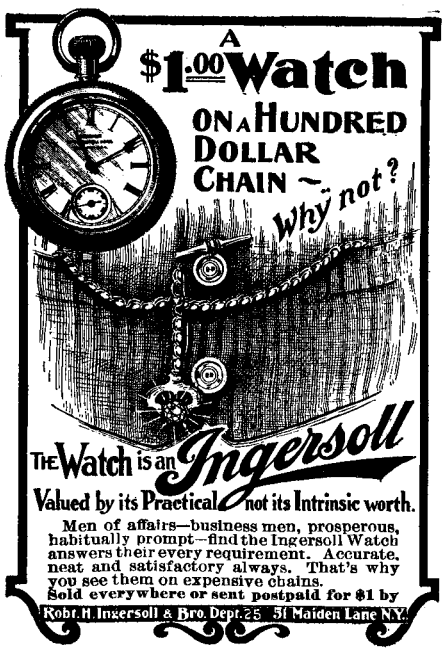

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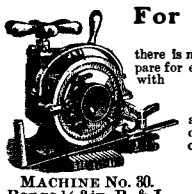

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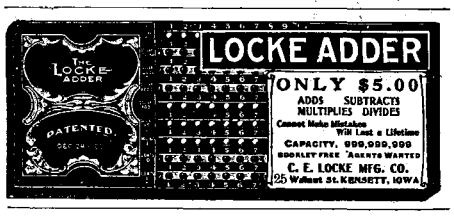

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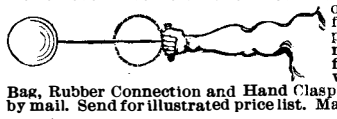

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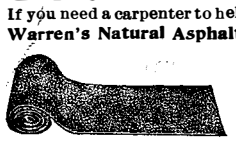

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Zinc, lead, and silver sulfids from their ores, extraction of, G. D. Delprat	735,071

DESIGNS.

Badge, S. Goodman	36,469
Bottle, L. F. Richards	36,479
Bottle, C. B. Gordon	36,480
Brushes or similar articles, back for, H. A. Weihman ..... 36,473 to	36,474
Brushes or similar toilet articles, back for, T. K. Benton 36,475,	36,476
Match safe, B. M. Ward	36,478
Ornament for vessels, etc., E. Bachle	36,470
Picture frame, H. L. Meyer	36,477
Pillow cover, sofa, C. M. Draper	36,483
Spoons or similar articles, handle for, Crees & Court	36,471
Spoons or similar articles, handle for, J. E. Straker, Jr.	36,472
Stand, G. D. Chisholm	36,481
Tiling, A. A. Spadone	36,482

TRADE MARKS.

Antiseptic, intestinal, Farbenfabriken of Elberfeld Co.	40,859
Baking powder, F. B. Chamberlain Commission Co.	40,874
Boots and shoes, leather, J. J. Costigan	40,842
Boots and shoes, leather, Utz & Dunn	40,843
Boots and shoes, leather, Green-Wheeler Shoe Company ..... 40,844 to	40,847
Brushes, fountain bath, Allen Manufacturing Company	40,880
Candy, Reymer & Brothers ..... 40,869 to	40,872
Cigars, L. K. Pope	40,865
Cigars and stogies, Crusader Stogie Company	40,864
Cloth used for linings, Saratoga Victory Manufacturing Company	40,852
Confectionery, New England Confectionery Company 40,867,	40,868
Corsets, women's, M. C. Whelan	40,849
Cravats and silk for same, L. Auerbach	40,851
Disinfectants, Mexican Disinfectant Company	40,862
Engines, including turbine motors, fluid-pressure motor, S. C. Davidson	40,884
Firearms, double weldless barrels for, P. E. Hennequin	40,883
Food, preparation for seasoning all varieties of, E. Meinrath	40,875
Food preparations for animals, aromatic, H. M. Griffin	40,878
Ham and breakfast bacon, Charles Wolff Packing Company 40,876,	40,877
Headwear, children's, Piebes & Co.	40,850
Horseshoes, A. G. Jennings	40,882
Laxatives, Foster-Milburn Company	40,857
Liniment, Shields Croup Liniment Company	40,861
Medical compound for the cure of coughs and colds, B. V. Howe	40,858
Medicines, certain named, A. P. Sawyer	40,856
Pants, overalls, coats, and vests, Richardson, Roberts Dry Goods Company	40,849
Paper, ledger, Annandale & Son	40,854
Papers, cover, Mittineague Paper Company	40,885
Perfumed preparations, certain named, Batcheller Importing Company	40,863
Seeds, certain named, Wood, Stubbs & Co.	40,866
Serum, Frederick Stearns & Co.	40,860
Varnishes and japans, J. G. Newcomb	40,879
Yeast cakes,, Peerless Yeast Company	40,873

LABELS.

"A. L. Fahnestock's Sure Pop Liniment," for medical compound, A. L. Fahnestock	10,214
"Argon Lotion," for toilet preparation, G. Sattler	10,212
"Banquets," for crackers, W. H. Faxon	10,225
"Barley Brew," for beverage, W. J. Bush & Co.	10,218
"Bender's Idealbandage," for bandages, E. Bender	10,213
"Black Seal," for cigars, Schmidt & Co.	10,235
"Butter Thins," for crackers, W. H. Faxon	10,226
"Cheese Wafers," for crackers, W. H. Faxon	10,224
"Chocolate Wafers," for cakes, W. H. Faxon	10,221
"Cuba Citrus Culture," for citrus fruits, G. H. Gillett	10,232
"El Speako," for cigars, Schmidt & Co.	10,234
"Ginger Wafers," for cakes, W. H. Faxon	10,220
"Graham Wafers," for crackers, W. H. Faxon	10,222
"Harrington's Air Tight Package," for leather soles and taps, Harrington & Co.	10,210
"Harrington Directions for Shoe Repairing," for leather soles and taps, Harrington & Co.	10,211
"Hunter Brand," for prunes, Willamette Valley Prune Association	10,231
"La Calinda," for cigars, A. L. Cohen	10,233
"Lion Lithia," for lithia water, Swineford Arsenic Lithia Water Company	10,217
"Milk Biscuits," for crackers, W. H. Faxon	10,223
"Milk Lunch," for crackers, W. H. Faxon	10,227
"Negaiwas Salve," for salve, M. P. Adams	10,215
"Old Smoke-House," for hams, Trousdale & Reily	10,229
"Pheasant Brand," for prunes, Willamette Valley Prune Association	10,230
"Security Gall Cure." for a gall cure, F. B. Dennie	10,216
"Unsweetened Nectar Milk," for condensed milk, H. Nestle	10,219
"Veribest," for hats, J. Marshall	10,209
"Water Thins," for crackers, W. H. Faxon.	10,228
"Wearbest," for hats, J. Marshall	10,208

PRINTS.

"Dust Collecting System," for blowpipes and dust collectors, United States Blow Pipe & Hydraulic Works	798
"Holland, Kaatje, and Moorish Backs Congress Playing Cards," for playing cards, United States Playing Card Company	799
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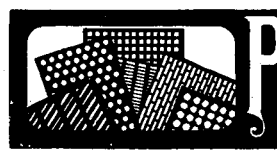

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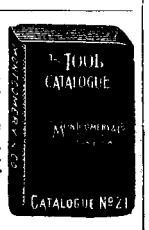

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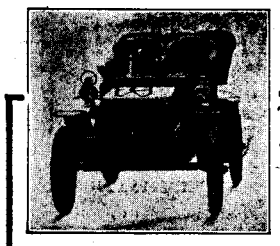

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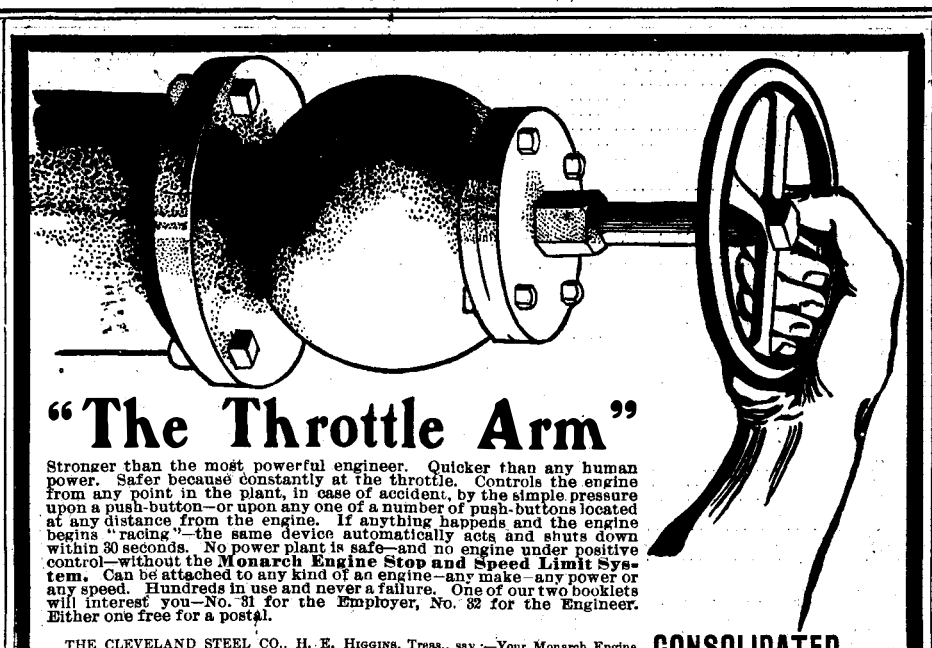

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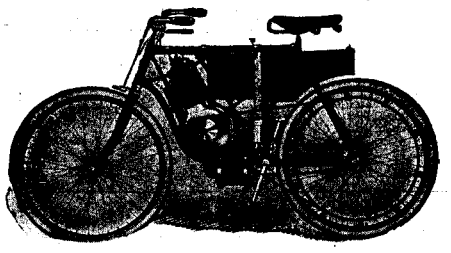

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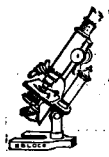

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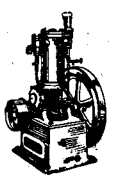

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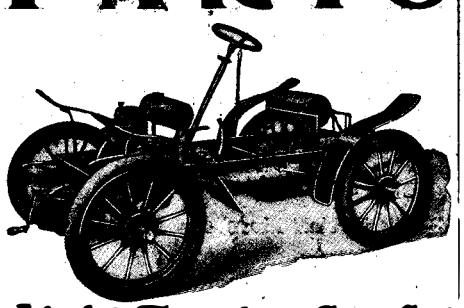

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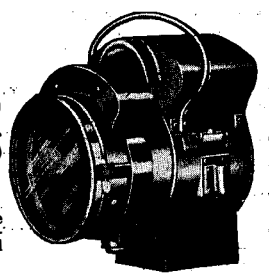

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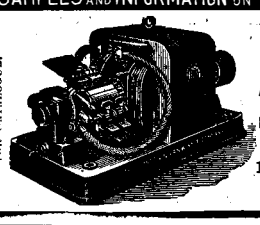

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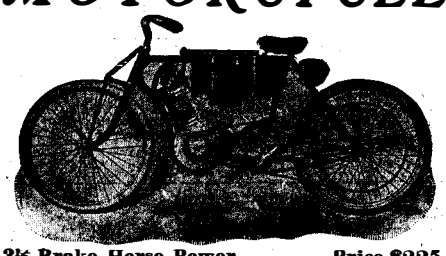

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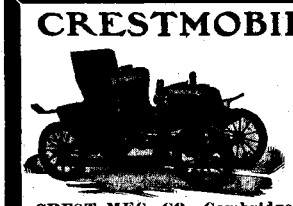

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